OMRON

Machine Automation Controller

NX-series

Digital I/O Units

User's Manual

NX-ID□□□□
NX-OC□□□□
NX-OD□□□□

Digital I/O Units

SYSMAC
always in control

W521-E1-01

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Introduction

Thank you for purchasing a NX-series Digital I/O Unit.

This manual contains information that is necessary to use the NX-series Digital I/O Unit. Please read this manual and make sure you understand the functionality and performance of the NX-series Digital I/O Unit before you attempt to use it in a control system.

Keep this manual in a safe place where it will be available for reference during operation.

Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of introducing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of installing and maintaining FA systems.
- Personnel in charge of managing FA systems and facilities.

For programming, this manual is intended for personnel who understand the programming language specifications in international standard IEC 61131-3 or Japanese standard JIS B3503.

Applicable Products

This manual covers the following product.

- NX-series Digital I/O Unit

  NX-ID□□□□ /OD□□□□ /OC□□□□

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Relevant Manuals

To use the Digital I/O Unit, you must refer to the manuals for all related products.

Read all of the manuals that are relevant to your system configuration and application before you use the NX-series Digital I/O Unit.

Most operations are performed from the Sysmac Studio Automation Software. Refer to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for information on the Sysmac Studio.

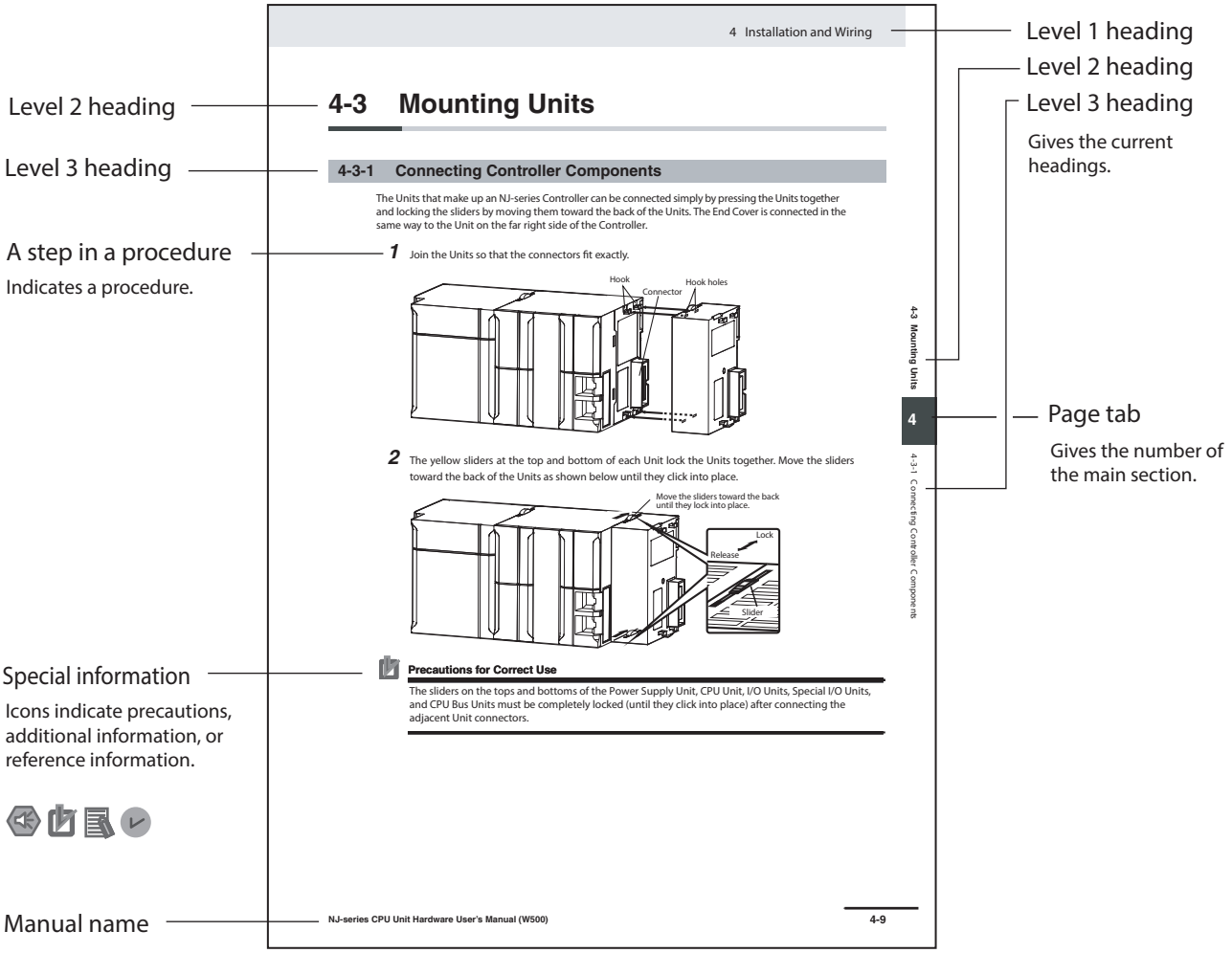
		NJ Series					NX Series					
							Communications Coupler Unit	NX Units				All Units
		NJ-series CPU Unit Hardware User's Manual	NJ-series CPU Unit Software User's Manual	NJ-series CPU Unit Motion Control User's Manual	NJ-series CPU Unit Built-in EtherCAT Port User's Manual	NJ-series Troubleshooting Manual	NX-series EtherCAT Coupler Unit User's Manual	NX-series Digital I/O Units User's Manual	NX-series Analog I/O Units User's Manual	NX-series System Units User's Manual	NX-series Position Interface Units User's Manual	NX-series Data Reference Manual
Learning about the NX-series Units												
Specifications							●	●	●	●	●	
Functionality							●	●	●	●	●	
Application procedures							●	●	●	●	●	
Learning about Slave Terminals							●					
Slave Terminal specifications							●					
System configuration							●					
Rules on building systems							●					
Slave Terminal application procedures							●					
Slave Terminal installation procedures							●					
Support Software connection procedures							●					
Procedure to estimate Slave Terminal performance							●					
Using NX-series Units with NJ-series Controllers												
Using a Slave Terminal connected to the built-in EtherCAT port on an NJ-series CPU Unit		●	●		●		●					
Procedures for performing motion control with Position Interface Units				●							●	

		NJ Series					NX Series					
							Communications Coupler Unit	NX Units				All Units
		NJ-series CPU Unit Hardware User's Manual	NJ-series CPU Unit Software User's Manual	NJ-series CPU Unit Motion Control User's Manual	NJ-series CPU Unit Built-in EtherCAT Port User's Manual	NJ-series Troubleshooting Manual	NX-series EtherCAT Coupler Unit User's Manual	NX-series Digital I/O Units User's Manual	NX-series Analog I/O Units User's Manual	NX-series System Units User's Manual	NX-series Position Interface Units User's Manual	NX-series Data Reference Manual
Troubleshooting												
	Managing errors for the overall NJ-series Controller					●						
	Troubleshooting Slave Terminals and Communications Coupler Units						●					
	Troubleshooting NX Units							●	●	●	●	
Performing Unit maintenance							●	●	●	●	●	
Referencing data lists for NX Unit power consumptions, weights, etc.												●

Manual Structure

Page Structure and Icons

The following page structure and icons are used in this manual.


4 Installation and Wiring
Level 1 heading
Level 2 heading
Level 3 heading
Gives the current headings.
Level 2 heading
4-3 Mounting Units
Level 3 heading
4-3-1 Connecting Controller Components
The Units that make up an NJ-series Controller can be connected simply by pressing the Units together and locking the sliders by moving them toward the back of the Units. The End Cover is connected in the same way to the Unit on the far right side of the Controller.
A step in a procedure
Indicates a procedure.
1 Join the Units so that the connectors fit exactly.
Hook
Connector
Hook holes
2 The yellow sliders at the top and bottom of each Unit lock the Units together. Move the sliders toward the back of the Units as shown below until they click into place.
Move the sliders toward the back until they lock into place.
Lock
Release
Slider
Special information
Icons indicate precautions, additional information, or reference information.
Precautions for Correct Use
The sliders on the tops and bottoms of the Power Supply Unit, CPU Unit, I/O Units, Special I/O Units, and CPU Bus Units must be completely locked (until they click into place) after connecting the adjacent Unit connectors.
4-3 Mounting Units
4
4-3-1 Connecting Controller Components
Page tab
Gives the number of the main section.
Manual name
NJ-series CPU Unit Hardware User's Manual (W500)
4-9

Note This illustration is provided only as a sample. It may not literally appear in this manual.

Special Information

Special information in this manual is classified as follows:

Precautions for Safe Use

Precautions on what to do and what not to do to ensure safe usage of the product.

Precautions for Correct Use

Precautions on what to do and what not to do to ensure proper operation and performance.

Additional Information

Additional information to read as required.

This information is provided to increase understanding or make operation easier.

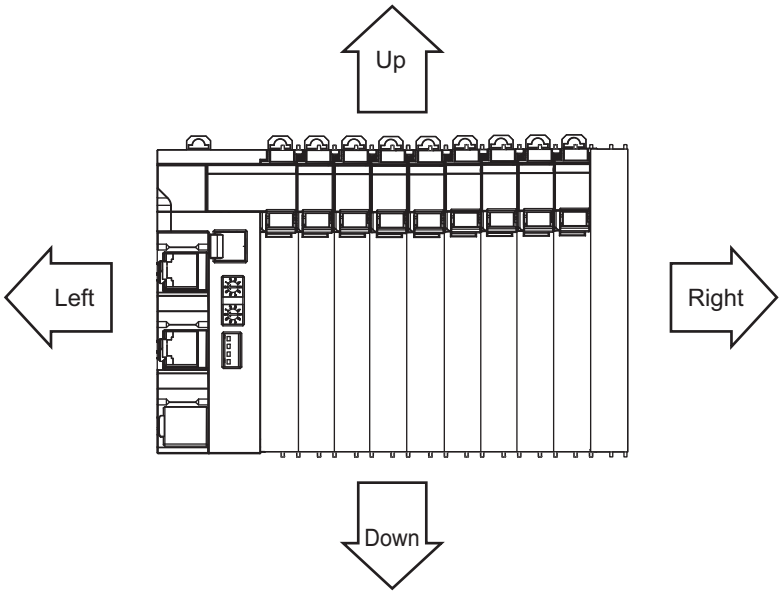
Version Information

Information on differences in specifications and functionality for CPU Units and EtherCAT Coupler Units with different unit versions and for different versions of the Sysmac Studio is given.

Note References are provided to more detailed or related information.

Precaution on Terminology

- In this manual, “download” refers to transferring data from the Sysmac Studio to the physical Controller and “upload” refers to transferring data from the physical Controller to the Sysmac Studio.
  For the Sysmac Studio, synchronization is used to both upload and download data. Here, “synchronize” means to automatically compare the data for the Sysmac Studio on the computer with the data in the physical Controller and transfer the data in the direction that is specified by the user.
- In this manual, the directions in relation to the Units are given in the following figure, which shows upright installation.



Read and Understand this Manual

Please read and understand this manual before using the products. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

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At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

Safety Precautions

Definition of Precautionary Information

The following notation is used in this manual to provide precautions required to ensure safe usage of an NX-series Digital I/O Unit.

The safety precautions that are provided are extremely important to safety. Always read and heed the information provided in all safety precautions.

The following notation is used.

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.
⚠ Caution	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

Symbols

	The circle and slash symbol indicates operations that you must not do. The specific operation is shown in the circle and explained in text. This example indicates prohibiting disassembly.
	The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a precaution for electric shock.
	The triangle symbol indicates precautions (including warnings). The specific operation is shown in the triangle and explained in text. This example indicates a general precaution.
	The filled circle symbol indicates operations that you must do. The specific operation is shown in the circle and explained in text. This example shows a general precaution for something that you must do.

Warnings

⚠ WARNING

During Power Supply

Do not touch the terminal section while power is ON.

Electric shock may occur.

Do not attempt to take any Unit apart.

In particular, high-voltage parts are present in Units that supply power while power is supplied or immediately after power is turned OFF. Touching any of these parts may result in electric shock. There are sharp parts inside the Unit that may cause injury.

Fail-safe Measures

Provide safety measures in external circuits to ensure safety in the system if an abnormality occurs due to malfunction of the CPU Unit, other Units, or slaves or due to other external factors affecting operation.

Not doing so may result in serious accidents due to incorrect operation.

Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.

The CPU Unit will turn OFF all outputs from Basic Output Units in the following cases. The remote I/O slaves will operate according to the settings in the slaves.

- If a power supply error occurs.
- If the power supply connection becomes faulty.
- If a CPU watchdog timer error or CPU reset occurs.
- If a Controller error in the major fault level occurs.
- While the CPU Unit is on standby until RUN mode is entered after the power is turned ON

External safety measures must be provided to ensure safe operation of the system in such cases.

The outputs may remain ON or OFF due to deposition or burning of the output relays or destruction of the output transistors. As a countermeasure for such problems, external safety measures must be provided to ensure safe operation of the system.

If external power supplies for slaves or other devices are overloaded or short-circuited, the voltage will drop, outputs will turn OFF, and the system may be unable to read inputs. Provide external safety measures in control with monitoring of external power supply voltage as required so that the system operates safely in such a case.

You must take fail-safe measures to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.

Not doing so may result in serious accidents due to incorrect operation.

Voltage and Current Inputs

Make sure that the voltages and currents that are input to the Units and slaves are within the specified ranges.

Inputting voltages or currents that are outside of the specified ranges may cause accidents or fire.

Transferring

Always confirm safety at the destination node before you transfer Unit configuration information, parameters, settings, or other data from tools such as the Sysmac Studio.

The devices or machines may operate unexpectedly, regardless of the operating mode of the Controller.

Cautions

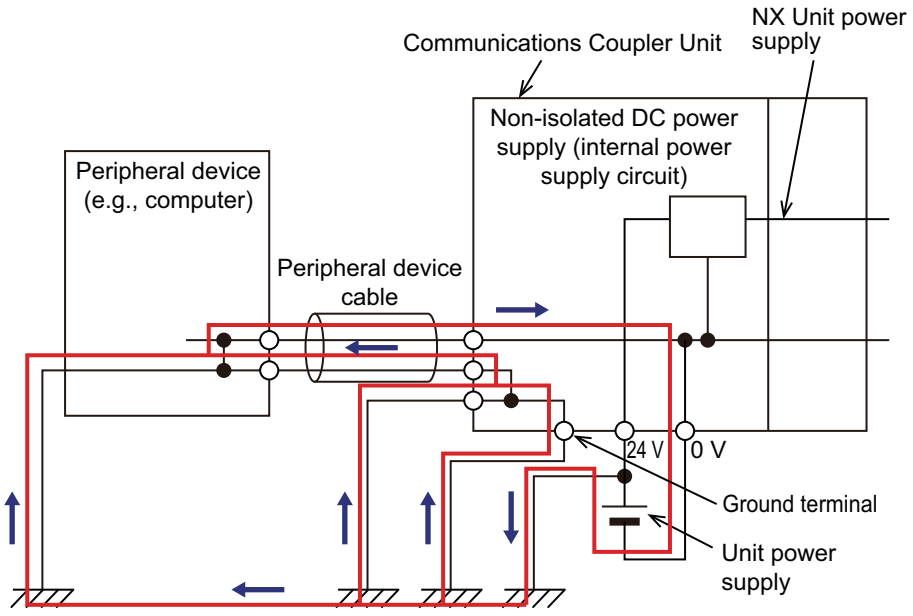
⚠ Caution

Wiring

When you connect a computer or other peripheral device to a Communications Coupler Unit that has a non-isolated DC power supply, either ground the 0-V side of the external power supply (i.e. Unit power supply) for the Unit power supply or do not ground it at all.

If the peripheral devices are grounded incorrectly, the external power supply (i.e. Unit power supply) may be short-circuited.

Never ground the 24-V side of the power supply, as shown in the following figure.



Online Editing

Execute online editing only after confirming that no adverse effects will be caused by deviations in the timing of I/O. If you perform online editing, the task execution time may exceed the task period, I/O may not be refreshed with external devices, input signals may not be read, and output timing may change.

Precautions for Safe Use

Transporting

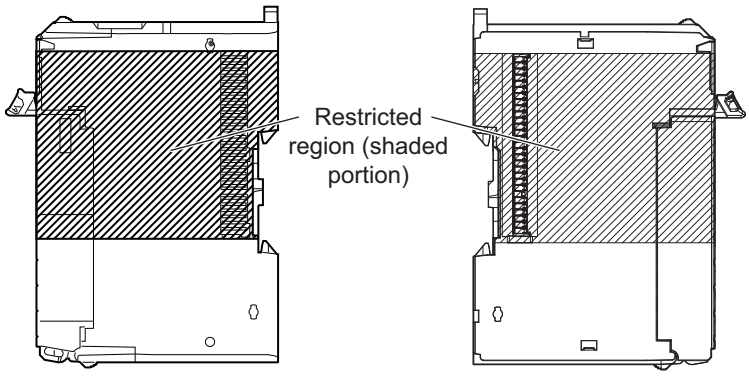
- When transporting any Unit, use the special packing box for it.
  Also, do not subject the Unit to excessive vibration or shock during transportation.
- Do not drop any Unit or subject it to abnormal vibration or shock.
  Doing so may result in Unit malfunction or burning.

Mounting

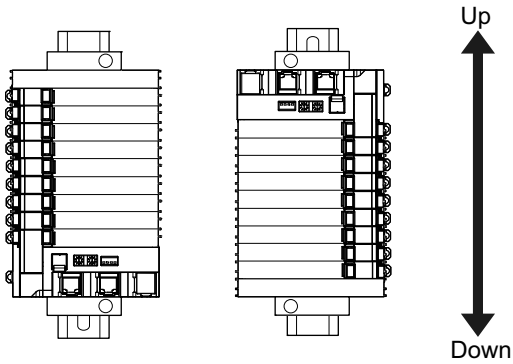
- Mount terminal blocks and connectors only after checking the mounting location carefully.
- Be sure that the terminal blocks, expansion cables, and other items with locking devices are properly locked into place.

Installation

- Do not apply labels or tape to the Unit. When the Unit is installed or removed, adhesive or scraps may adhere to the pins in the NX bus connector, which may result in malfunctions.
- Do not write on the Communications Coupler Unit or an NX Unit with ink within the restricted region that is shown in the following figure. Also do not get this area dirty. When the Unit is installed or removed, ink or dirt may adhere to the pins in the NX bus connector, which may result in malfunctions in the Slave Terminal.



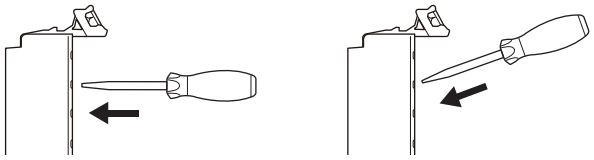
- For the installation orientations in the following figure, support the cables, e.g., with a duct, so that the End Plate on the bottom is not subjected to the weight of the cables. The weight of the cables may cause the bottom End Plate to slide downward so that the Slave Terminal is no longer secured to the DIN Track, which may result in malfunctions.



Wiring

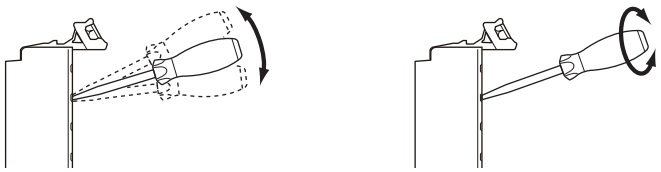
- Double-check all switches and other settings and double-check all wiring to make sure that they are correct before turning ON the power supply.
  Use the correct wiring parts and tools when you wire the system.
- Do not pull on the cables or bend the cables beyond their natural limit. Also, do not place heavy objects on top of the cables or other wiring lines. Doing so may break the cable.
- When wiring or installing the Units, do not allow metal fragments to enter the Units.
- Do not press the flat-blade screwdriver straight into the release holes on a screwless clamping terminal block. Doing so may damage the terminal block.

NG **OK**



- When you insert a flat-blade screwdriver into a release hole on a screwless clamping terminal block, press it down with a force of 30N or less. Applying excessive force may damage the terminal block.
- Do not incline or twist the flat-blade screwdriver while it is in a release hole on a screwless clamping terminal block. Doing so may damage the terminal block.

NG **NG**



Power Supply Design

- Use all Units within the I/O power supply ranges that are given in the specifications.
- Supply sufficient power according to the contents of this manual.
- Use the power supply voltage that is specified in this manual.
- Do not apply voltages that exceed the rated value to any Input Unit.
- Do not apply voltages or connect loads to the Output Units or slaves in excess of the maximum ratings.
- Inrush current occurs when the power supply is turned ON. When selecting fuses or breakers for external circuits, consider their fusing and detection characteristics as well as the above precautions and allow sufficient margin in shut-off performance.
- Install external breakers and take other safety measures against short-circuiting and overcurrents in external wiring.

Turning ON the Power Supply

- When you set the Operating Mode at Startup, confirm that no adverse effect will occur in the system.

Actual Operation

- Before you start operation, always register the NX Units that are connected to the Communications Coupler Unit in the host communications master as the Unit Configuration Information.
- Check the user program, data, and parameter settings for proper execution before you use them for actual operation.

Turning OFF the Power Supply

- Do not disconnect the cable or turn OFF the power supply to the Controller or a Slave Terminal when downloading data or the user program from Sysmac Studio.
- Always turn OFF the external power supply to the Units before attempting any of the following.

  Mounting or removing an NX Unit, Communications Coupler Unit, or CPU Unit
  Assembling Units
  Setting DIP switches or rotary switches
  Connecting or wiring cables
  Attaching or removing terminal blocks or connectors

  Units that supply power continue to supply power to the Units for up to several seconds after the power supply is turned OFF. The PWR indicator remains lit as long as power is supplied. Confirm that the PWR indicator is not lit before you perform any of the above.

Operation

- Confirm that the controlled system will not be adversely affected before you perform any of the following operations.

  Changing the operating mode of the CPU Unit (including changing the setting of the Operating Mode at Startup)
  Changing the user program or settings
  Changing set values or present values
  Forced refreshing

- Always sufficiently check the safety at the connected devices before you change the settings of an EtherCAT slave or Special Unit.

General Communications

- Do not exceed the ranges that are given in the specifications for the communications distance and number of connected Units.

EtherCAT Communications

- Make sure that the communications distance, number of nodes connected, and method of connection for EtherCAT are within specifications.
  Do not connect EtherCAT Coupler Units to EtherNet/IP, a standard in-house LAN, or other networks. An overload may cause the network to fail or malfunction.
- Malfunctions or unexpected operation may occur for some combinations of EtherCAT revisions of the master and slaves. If you disable the revision check in the network settings, check the slave revision settings in the master and the actual slave revisions, and then make sure that functionality is compatible in the manuals or other references. You can check the slave versions in the settings from the Sysmac Studio and you can check the actual slave revisions from the Sysmac Studio or on slave nameplates.

- After you transfer the user program, the CPU Unit is restarted and communications with the EtherCAT slaves are cut off. During that period, the slave outputs behave according to the slave settings. The time that communications are cut off depends on the EtherCAT network configuration.
  Before you transfer the user program, confirm that the system will not be adversely affected.
- EtherCAT communications are not always established immediately after the power supply is turned ON. Use the system-defined variables in the user program to confirm that communications are established before attempting control operations.
- If frames sent to EtherCAT slaves are lost due to noise or other causes, slave I/O data is not communicated, and the intended operation is sometimes not achieved. Perform the following processing if noise countermeasures are necessary.

  Program the *_EC_InDataInvalid* (Input Data Disable) system-defined variable as an interlock condition in the user program.
  Set the *PDO communications consecutive timeout detection count* setting in the EtherCAT master to at least 2.
  Refer to the *NJ-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505) for details.
- When an EtherCAT slave is disconnected, communications will stop and control of the outputs will be lost not only for the disconnected slave, but for all slaves connected after it. Confirm that the system will not be adversely affected before you disconnect a slave.
- If you disconnect the cable from an EtherCAT slave to disconnect it from the network, any current communications frames may be lost. If frames are lost, slave I/O data is not communicated, and the intended operation is sometimes not achieved. Perform the following processing for a slave that needs to be replaced.

  Program the *_EC_InDataInvalid* (Input Data Disable) system-defined variable as an interlock condition in the user program.
  Set the *PDO communications consecutive timeout detection count* setting in the EtherCAT master to at least 2.
  Refer to the *NJ-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505) for details.

Unit Replacement

- When you replace a Unit, start operation only after you transfer the settings and variables that are required for operation to the new Unit.

Disposal

- Dispose of the product according to local ordinances as they apply.

Precautions for Correct Use

Storage, Mounting, and Wiring

- Follow the instructions in this manual to correctly perform installation.
- Do not operate or store the Units in the following locations. Operation may stop or malfunction may occur.

  Locations subject to direct sunlight
  Locations subject to temperatures or humidity outside the range specified in the specifications
  Locations subject to condensation as the result of severe changes in temperature
  Locations subject to corrosive or flammable gases
  Locations subject to dust (especially iron dust) or salts
  Locations subject to exposure to water, oil, or chemicals
  Locations subject to shock or vibration
- Take appropriate and sufficient countermeasures during installation in the following locations.

  Locations subject to strong, high-frequency noise
  Locations subject to static electricity or other forms of noise
  Locations subject to strong electromagnetic fields
  Locations subject to possible exposure to radioactivity
  Locations close to power lines
- Before touching a Unit, be sure to first touch a grounded metallic object in order to discharge any static build-up.
- Use the rated power supply voltage for the Units that supply power. Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied in places where the power supply is unstable.
- Install the Units away from sources of heat and ensure proper ventilation. Not doing so may result in malfunction, in operation stopping, or in burning.
- Do not allow foreign matter to enter the openings in the Unit. Doing so may result in Unit burning, electric shock, or failure.
- Use the EtherCAT connection methods and applicable cables that are specified in this manual and in the *NJ-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505). Otherwise, communications may be faulty.

Actual Operation

- If you change the event level of an error, the output status when the error occurs may also change. Confirm safety before you change an event level.

Turning OFF the Power Supply

- Do not turn OFF the power supply while data is being transferred.
- Do not turn OFF the power supply while parameters are being written to the Communications Coupler Unit or NX Units.

EtherCAT Communications

- Do not disconnect the EtherCAT communications cables during operation. The outputs will become unstable. However, for the built-in EtherCAT port on the NJ-series CPU Unit, it is OK to disconnect the communications cable from an EtherCAT Slave Terminal that has been disconnected from communications in the software.

Regulations and Standards

Conformance to EC Directives

Applicable Directives

- EMC Directives
- Low Voltage Directive

Concepts

● EMC Directives

OMRON devices that comply with EC Directives also conform to the related EMC standards so that they can be more easily built into other devices or the overall machine. The actual products have been checked for conformity to EMC standards.*1

Whether the products conform to the standards in the system used by the customer, however, must be checked by the customer. EMC-related performance of the OMRON devices that comply with EC Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed. The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.

*1. Applicable EMC (Electromagnetic Compatibility) standards are as follows:
EMS (Electromagnetic Susceptibility): EN 61131-2
EMI (Electromagnetic Interference): EN 61131-2 (Radiated emission: 10-m regulations).

● Low Voltage Directive

Always ensure that devices operating at voltages of 50 to 1,000 VAC and 75 to 1,500 VDC meet the required safety standards. The applicable directive is EN 61131-2.

● Conformance to EC Directives

The NX-series Units comply with EC Directives. To ensure that the machine or device in which the NX-series Units are used complies with EC Directives, the following precautions must be observed.

- The NX-series Units must be installed within a control panel.
- You must use reinforced insulation or double insulation for the DC power supplies that are connected as the Unit power supplies and I/O power supplies for the NX-series Units.

  We recommend that you use the OMRON S8JX-series Power Supplies. EMC standard compliance was confirmed for the recommended Power Supplies.
- NX-series Units that comply with EC Directives also conform to the Common Emission Standard (EN 61131-2). Radiated emission characteristics (10-m regulations) may vary depending on the configuration of the control panel used, other devices connected to the control panel, wiring, and other conditions.

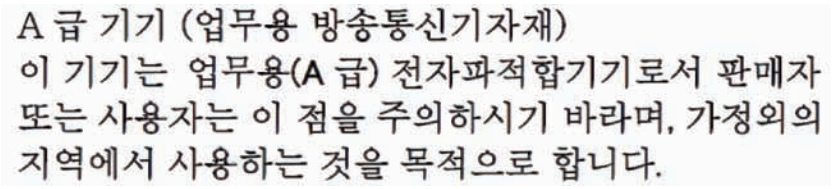
  You must therefore confirm that the overall machine or equipment in which the NX-series Units are used complies with EC Directives.
- You must use power supplies with an output hold time of 10 ms or longer for the DC power supplies that are connected as the Unit power supplies and I/O power supplies for the NX-series Units.
- This is a Class A product (for industrial environments). In a residential environment, it may cause radio interference. If radio interference occurs, the user may be required to take appropriate measures

Conformance to UL and CSA Standards

The NX-series Units comply with the following UL and CSA standards. The application conditions for standard compliance are defined. Refer to the *Instruction Sheet* that is provided with each Unit before application.

Conformance to KC Standards

Observe the following precaution if you use NX-series Units in Korea.


A 급 기기 (업무용 방송통신기자재)
이 기기는 업무용(A 급) 전자파적합기기로서 판매자
또는 사용자는 이 점을 주의하시기 바라며, 가정외의
지역에서 사용하는 것을 목적으로 합니다.

Class A Device (Broadcasting Communications Device for Office Use)

This device obtained EMC registration for office use (Class A), and it is intended to be used in places other than homes.

Sellers and/or users need to take note of this.

Software Licenses and Copyrights

This product incorporates certain third party software. The license and copyright information associated with this software is available at http://www.fa.omron.co.jp/nj_info_e/.

Unit Versions

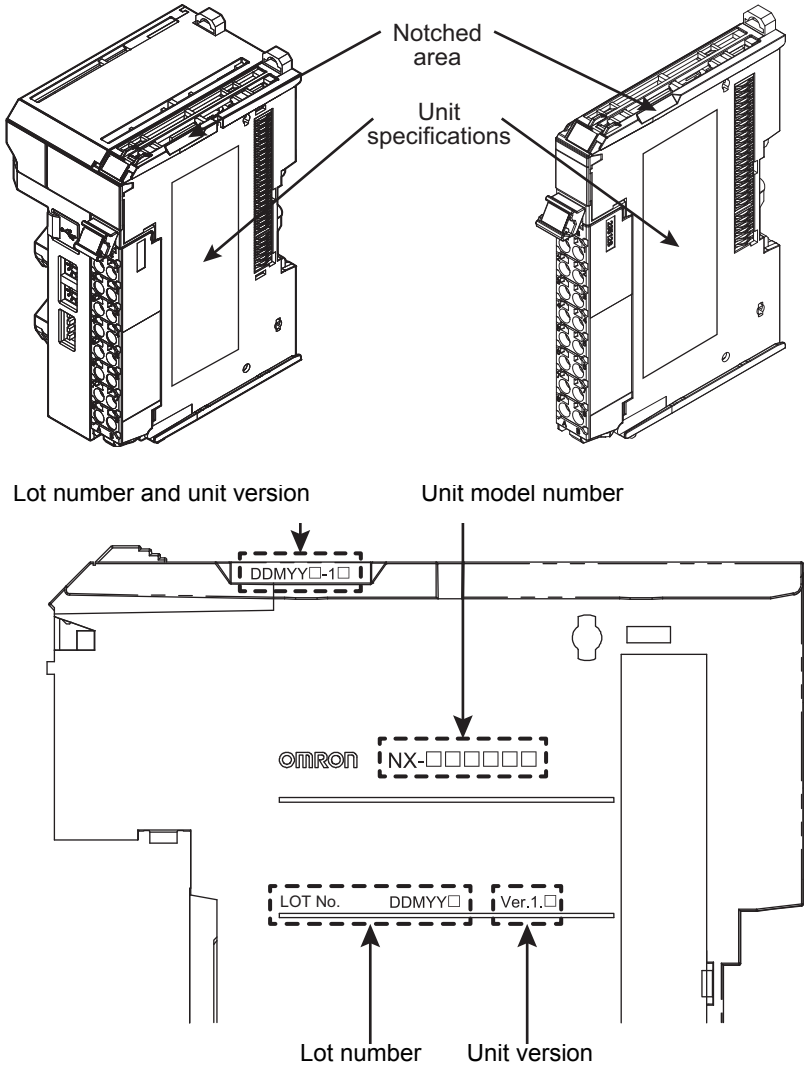
This section describes the notation that is used for unit versions, the confirmation method for unit versions, and the relationship between unit versions and Sysmac Studio versions.

Unit Versions

A “unit version” has been introduced to manage the Units in the NX Series according to differences in functionality accompanying Unit upgrades.

Notation of Unit Versions on Products

The unit version is given with the Unit specifications on the side of the Unit or in the notched area.



The following information is provided in the Unit specifications on the Unit.

Name	Function
Unit model number	Gives the model of the Unit.
Unit version	Gives the unit version of the Unit.
Lot number	Gives the lot number of the Unit. DDMYY□: Lot number, □: Used by OMRON. “M” gives the month (1 to 9: January to September, X: October, Y: November, Z: December)

The following information is provided in the notched area on the Unit.

Name	Function
Lot number and unit version	Gives the lot number and unit version of the Unit. • DDMYY□: Lot number, □: Used by OMRON. "M" gives the month (1 to 9: January to September, X: October, Y: November, Z: December) • 1□: Unit version The decimal portion of the unit version is omitted. (It is provided in the Unit specifications.)

Confirming Unit Versions with the Sysmac Studio

You can use the Unit Production Information on the Sysmac Studio to check the unit versions EtherCAT Coupler Unit and NX Units.

1 Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer, and then double-click the EtherCAT Coupler Unit. Or, right-click the EtherCAT Coupler Unit and select ***Edit*** from the menu.
The Edit Slave Terminal Configuration Tab Page is displayed.

You can also display the Edit Slave Terminal Configuration Tab Page with any of the following operations.

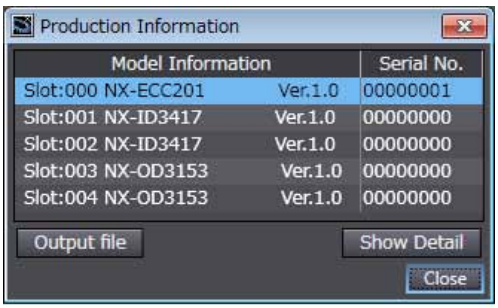
Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer, right-click the EtherCAT Coupler Unit in the EtherCAT Configuration Edit Tab Page, and select ***Edit Slave Terminal Configuration***.

Or, select the EtherCAT Coupler Unit on the EtherCAT Configuration Edit Tab Page click the **Edit Slave Terminal Configuration** Button.

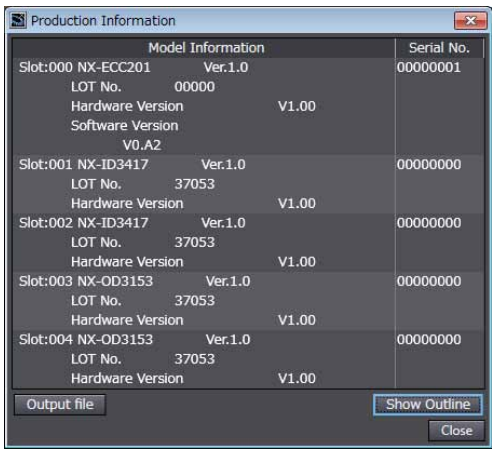
2 Go online.

3 Right-click the EtherCAT Coupler Unit and select ***Display Production Information*** from the menu.

The Production Information Dialog Box is displayed.



Simple Display



Detailed Display

In this example, "Ver.1.0" is displayed next to the Unit model.

The following items are displayed.

- Slot number
- Unit model number
- Unit version
- Serial number
- Lot number

- Hardware version
- Software version

The software version is displayed only for Units that contain software.

Unit Version Notation

In this User's Manual, unit versions are specified as shown in the following table.

Unit version in Unit specifications on the product	Notation in this manual	Remarks
Unit version 1.0 or later	Ver. 1.□ or later	Unless unit versions are specified, the information in this manual applies to all unit versions.

Related Manuals

The following manuals are related to the NJ-series Controllers. Use these manuals for reference.

Manual name	Cat. No.	Model numbers	Application	Description
NX-series EtherCAT® Coupler Unit User's Manual	W519	NX-ECC201	Leaning how to use an NX-series EtherCAT Coupler Unit and EtherCAT Slave Terminals	The following items are described: the overall system and configuration methods of an EtherCAT Slave Terminal (which consists of an NX-series EtherCAT Coupler Unit and NX Units), and information on hardware, setup, and functions to set up, control, and monitor NX Units through EtherCAT.
NJ-series CPU Unit Hardware User´s Manual	W500	NJ501-□□□□ NJ301-□□□□	Learning the basic specifications of the NJ-series CPU Units, including introductory information, designing, installation, and maintenance. Mainly hardware information is provided.	An introduction to the entire NJ-series system is provided along with the following information on the CPU Unit. • Features and system configuration • Overview • Part names and functions • General specifications • Installation and wiring • Maintenance and Inspection Use this manual together with the *NJ-series CPU Unit Software User's Manual* (Cat. No. W501).
NJ-series CPU Unit Software User's Manual	W501	NJ501-□□□□ NJ301-□□□□	Learning how to program and set up an NJ-series CPU Unit. Mainly software information is provided.	The following information is provided on an NJ-series CPU Unit. • CPU Unit operation • CPU Unit features • Initial settings • Programming based on IEC 61131-3 language specifications Use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500).
NJ-series CPU Unit Built-in EtherCAT® Port User's Manual	W505	NJ501-□□□□ NJ301-□□□□	Using the built-in EtherCAT port on an NJ-series CPU Unit.	Information on the built-in EtherCAT port is provided. This manual provides an introduction and provides information on the configuration, features, and setup. Use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500) and *NJ-series CPU Unit Software User's Manual* (Cat. No. W501).
NX-series Digital I/O Units User's Manual (this manual)	W521	NX-ID□□□□ NX-OC□□□□ NX-OD□□□□	Learning how to use NX-series Digital I/O Units	The hardware, setup methods, and functions of the NX-series Digital I/O Units are described.

Manual name	Cat. No.	Model numbers	Application	Description
NX-series Analog I/O Units User's Manual	W522	NX-AD□□□□ NX-DA□□□□ NX-TS□□□□	Learning how to use NX-series Analog I/O Units and Temperature Input Units	The hardware, setup methods, and functions of the NX-series Analog I/O Units and Temperature Input Units are described.
NX-series System Units User's Manual	W523	NX-PD1□□□ NX-PF0□□□ NX-PC0□□□ NX-TBX01	Learning how to use NX-series System Units	The hardware and functions of the NX-series System Units are described.
NX-series Position Interface Units User's Manual	W524	NX-EC0□□□ NX-ECS□□□ NX-PG0□□□	Learning how to use NX-series Position Interface Units	The hardware, setup methods, and functions of the NX-series Incremental Encoder Input Units, SSI Input Units, and Pulse Output Unit are described.
NX-series Data Reference Manual	W525	NX-□□□□□□	Referencing lists of the data that is required to configure systems with NX-series Units	Lists of the power consumptions, weights, and other NX Unit data that is required to configure systems with NX-series Units are provided.
NJ-series CPU Unit Motion Control User's Manual	W507	NJ501-□□□□ NJ301-□□□□	Learning about motion control settings and programming concepts.	The settings and operation of the CPU Unit and programming concepts for motion control are described. When programming, use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500) and *NJ-series CPU Unit Software User's Manual* (Cat. No. W501).
NJ-series Instructions Reference Manual	W502	NJ501-□□□□ NJ301-□□□□	Learning detailed specifications on the basic instructions of an NJ-series CPU Unit.	The instructions in the instruction set (IEC 61131-3 specifications) are described. When programming, use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500) and *NJ-series CPU Unit Software User's Manual* (Cat. No. W501).
NJ-series Motion Control Instructions Reference Manual	W508	NJ501-□□□□ NJ301-□□□□	Learning about the specifications of the motion control instructions.	The motion control instructions are described. When programming, use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500), *NJ-series CPU Unit Software User's Manual* (Cat. No. W501) and *NJ-series CPU Unit Motion Control User's Manual* (Cat. No. W507).
Sysmac Studio Version 1 Operation Manual	W504	SYSMAC-SE2□□□	Learning about the operating procedures and functions of the Sysmac Studio.	Describes the operating procedures of the Sysmac Studio.

Manual name	Cat. No.	Model numbers	Application	Description
NJ-series Troubleshooting Manual	W503	NJ501-□□□□ NJ301-□□□□	Learning about the errors that may be detected in an NJ-series Controller.	Concepts on managing errors that may be detected in an NJ-series Controller and information on individual errors are described. Use this manual together with the *NJ-series CPU Unit Hardware User's Manual* (Cat. No. W500) and *NJ-series CPU Unit Software User's Manual* (Cat. No. W501).

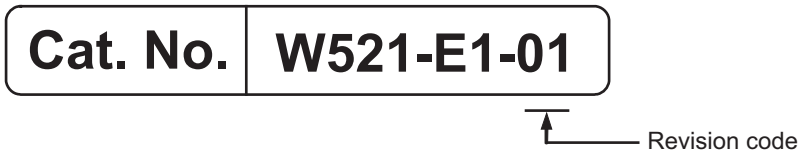
Terminology

Term	Abbre-viation	Description
application layer status, AL status	---	Status for indicating information on errors that occur in an application on a slave.
CAN application protocol over Ether-CAT	CoE	A CAN application protocol service implemented on EtherCAT.
CAN in Automation	CiA	CiA is the international users' and manufacturers' group that develops and supports higher-layer protocols.
Communications Coupler Units	---	The generic name of an interface unit for remote I/O communications on a network between NX Units and a host network master.
device profile	---	A collection of device dependent information and functionality providing consistency between similar devices of the same device type.
device variable	---	A variable in the NJ-series CPU Unit to which process data on an Ether-CAT slave is allocated. Slave process data is accessed by directly read-ing and writing device variables from user applications on the NJ-series CPU Unit.
distributed clock	DC	Clock distribution mechanism used to synchronize EtherCAT slaves and the EtherCAT master.
EtherCAT slave controller	ESC	A controller for EtherCAT slave communications.
EtherCAT slave information	ESI	An XML file that contains setting information for an EtherCAT slave.
EtherCAT state machine	ESM	An EtherCAT communications state machine.
EtherCAT Technology Group	ETG	The ETG is a global organization in which OEM, end users, and technol-ogy providers join forces to support and promote the further technology development.
I/O map settings	---	Settings that assign variables to I/O ports. Assignment information between I/O ports and variables.
I/O port	---	A logical interface that is used by the CPU Unit to exchange data with an external device (slave or Unit).
I/O refreshing	---	Cyclic data exchange with external devices that is performed with prede-termined memory addresses.
index	---	Address of an object within an application process.
network configuration information	---	The EtherCAT network configuration information held by the EtherCAT master.
NX bus	---	The NX-series internal bus.
object	---	An abstract representation of a particular component within a device, which consists of data, parameters, and methods.
object dictionary	OD	Data structure that contains description of data type objects, communi-cation objects and application objects.
Operational	---	A state in EtherCAT communications where SDO communications and I/O are possible.
PDO communications	---	An acronym for process data communications.
Pre-Operational	---	A state in EtherCAT communications where only SDO communications are possible with the slaves, i.e., no I/O can be performed.
primary periodic task	---	The task with the highest priority.
process data	---	Collection of application objects designated to be downloaded cyclically or acyclically for the purpose of measurement and control.
process data communications	---	One type of EtherCAT communications in which process data objects (PDOs) are used to exchange information cyclically and in realtime. This is also called PDO communications.
process data object	PDO	A structure that describes the mappings of parameters that have one or more process data entities.
receive PDO	RxPDO	A process data object received by an EtherCAT slave.

Term	Abbre-viation	Description
Safe-Operational	---	A state in EtherCAT communications where only SDO communications and reading input data from slaves are possible. Outputs from slaves are not performed.
SDO communications	---	One type of EtherCAT communications in which service data objects (SDOs) are used to transmit information whenever required.
service data object	SDO	CoE asynchronous mailbox communications where all objects in the object dictionary can be read and written.
Slave Information Interface	SII	Slave information that is stored in non-volatile memory in the slave.
Slave Terminal	---	A building-block remote I/O terminal to which a Communications Coupler Unit and NX Units are mounted
subindex	---	Sub-address of an object within the object dictionary.
Sync Manager	SM	Collection of control elements to coordinate access to concurrently used objects.
task period	---	The interval at which the primary periodic task or a periodic task is executed.
transmit PDO	TxPDO	A process data object sent from an EtherCAT slave.

Revision History

A manual revision code appears as a suffix to the catalog number on the front and back covers of the manual.



Revision code	Date	Revised content
01	April 2013	Original production

Sections in this Manual

1 Features and System Configuration
2 Specifications
3 Part Names and Functions
4 Installation and Wiring
5 I/O Refreshing
6 Digital Input Units
7 Digital Output Units
8 Troubleshooting
9 Inspection and Maintenance
A Appendices
I Index

1

Features and System Configuration

This section describes NX system configuration and the types of Digital I/O Units.

1-1 Features and Types of Digital I/O Units 1-2
1-1-1 Digital I/O Unit Features 1-2
1-1-2 Digital I/O Unit Types 1-2
1-2 System Configuration of Slave Terminals 1-3
1-2-1 Overview 1-3
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1-3-3 Digital Output Units 1-8
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1-1 Features and Types of Digital I/O Units

This section describes features and types of Digital I/O Units.

1-1-1 Digital I/O Unit Features

The Digital I/O Units are NX Units to process inputs and outputs of digital signals (ON/OFF signals).

The NX-series Digital I/O Units have the following features.

Synchronous I/O with Refresh Cycle of the NX Bus

When the EtherCAT Coupler Unit is used together with NX Units that support synchronous I/O refreshing, the I/O control of multiple NX Units can be synchronized at the time to synchronize with the refresh cycle of the NX bus.

This provides an accurate I/O control because it suppresses jitter in the I/O timing of multiple NX Units.

Simple I/O Wiring with a Screwless Clamping Terminal Block

The terminal block is a screwless clamping terminal block.

You can connect the wires simply by pushing the ferrules into the terminals. The amount of wiring work is reduced without requiring the use of screws.

1-1-2 Digital I/O Unit Types

The types of Digital I/O Units are as follows.

Type	Purpose
Digital Input Units	These are Units with functionality to process input of digital signals from sensors and other connected external devices.
Digital Output Units	These are Units with functionality to process output of digital signals to relays and other connected external devices.

Refer to *1-3 Model List* on page 1-5 for details on Digital I/O Unit models and *1-4 List of Functions* on page 1-9 for details on their functions.

1-2 System Configuration of Slave Terminals

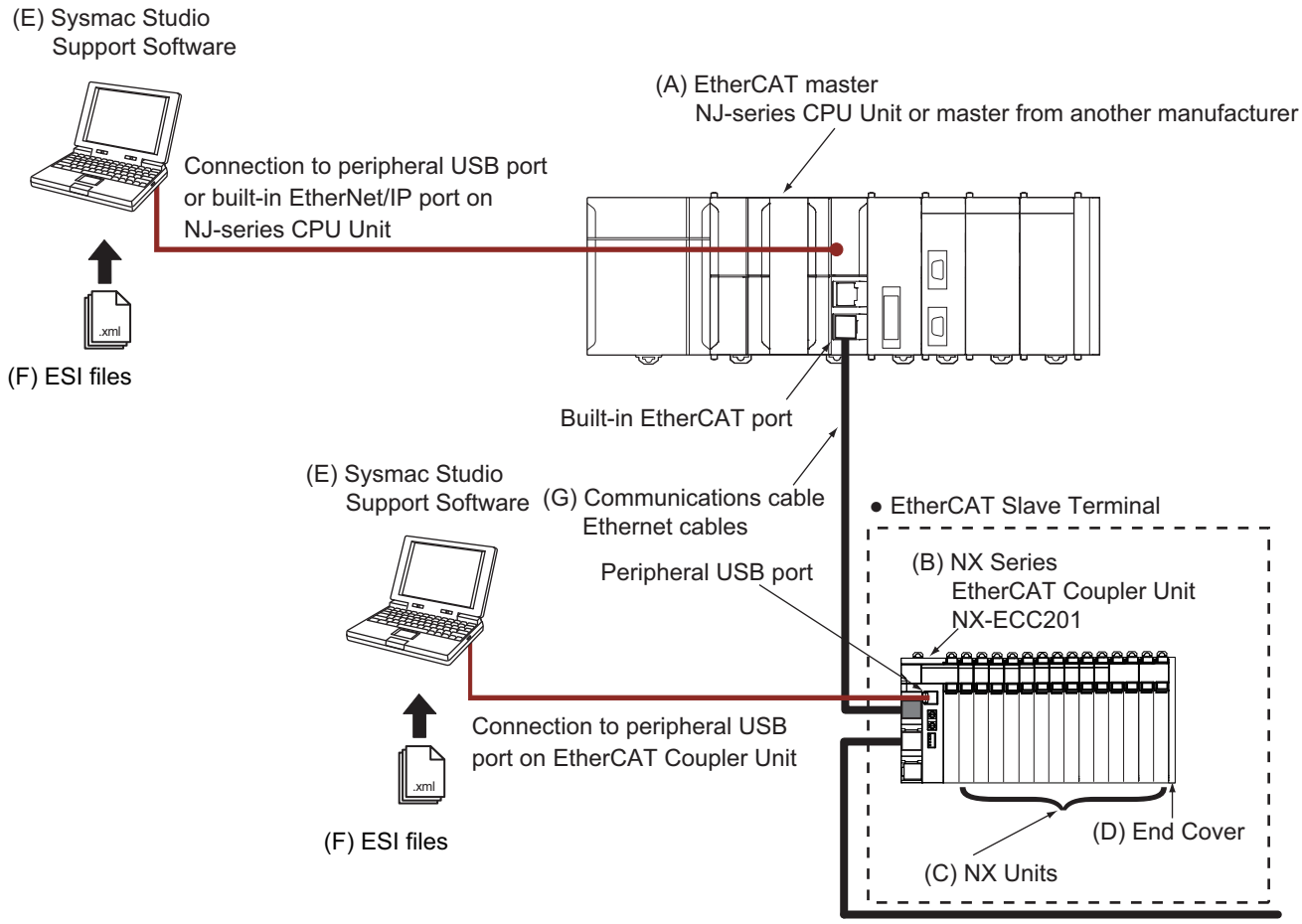
1-2-1 Overview

The Slave Terminal is a building-block remote I/O slave that is created by mounting a group of NX Units to a Communications Coupler Unit.

The NX Units can be flexibly combined with a Communications Coupler Unit to achieve the optimum remote I/O slave for the application with less wiring, less work, and less space.

1-2-2 System Configuration

The following figure shows an example of the system configuration when an EtherCAT Coupler Unit is used as a Communications Coupler Unit.



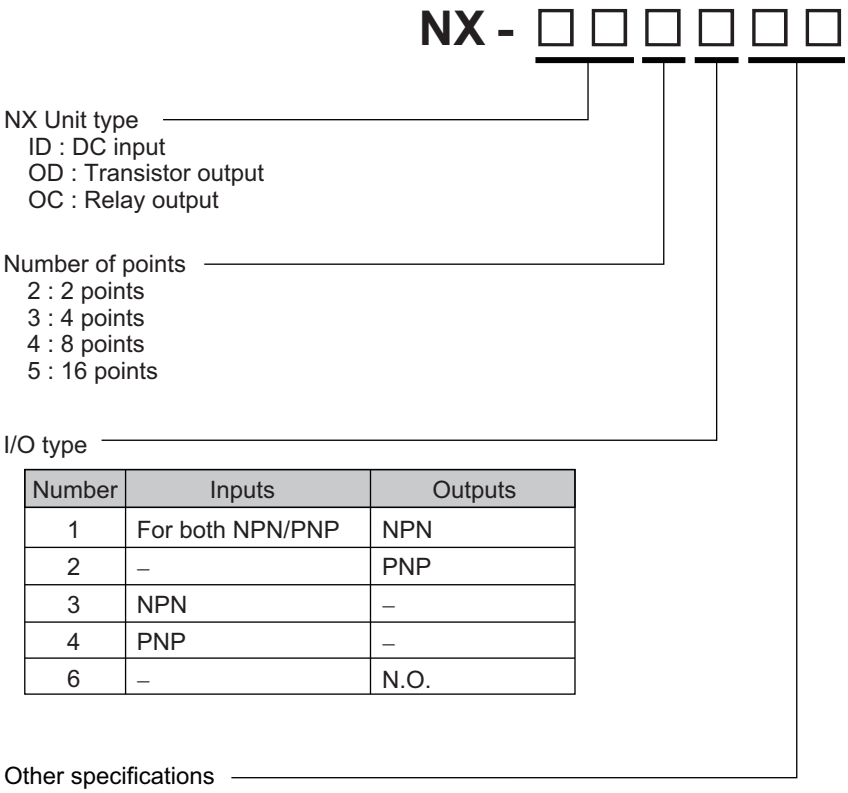
Letter	Item	Description
(A)	EtherCAT master *1	The EtherCAT master manages the network, monitors the status of slaves, and exchanges I/O data with slaves.
(B)	EtherCAT Coupler Unit	The EtherCAT Coupler Unit serves as an interface for process data communications on the EtherCAT network between the NX Units and the EtherCAT master. The I/O data for the NX Units is accumulated in the EtherCAT Coupler Unit and then all of the data is exchanged with the EtherCAT master at the same time. The EtherCAT Coupler Unit can also perform message communications (SDO communications) with the EtherCAT master.
(C)	NX Units	The NX Units perform I/O processing with connected external devices. The NX Units perform process data communications with the EtherCAT master through the EtherCAT Coupler Unit.
(D)	End Cover	The End Cover is attached to the end of the Slave Terminal.
(E)	Sysmac Studio Support Software	The Sysmac Studio runs on a personal computer and it is used to configure the EtherCAT network and EtherCAT Slave Terminal, and to program, monitor, and troubleshoot the Controllers. You can connect the computer, in which the Sysmac Studio is installed, to the peripheral USB port or built-in EtherNet/IP port on an NJ-series CPU Unit to set up the EtherCAT Slave Terminal. Or you can connect it to the peripheral USB port on the EtherCAT Coupler Unit to set up the EtherCAT Slave Terminal.
(F)	ESI (EtherCAT Slave Information) file	The ESI file contains information that is unique to the EtherCAT Slave Terminal in XML format. You can load the ESI file into the Sysmac Studio to easily allocate Slave Terminal process data and configure other settings. The ESI files for OMRON EtherCAT slaves are already installed in the Sysmac Studio. You can update the Sysmac Studio to get the ESI files for the most recent models.
(G)	Communications cable	Use a double-shielded cable with aluminum tape and braiding of Ethernet category 5 (100Base-TX) or higher, and use straight wiring.

*1. An EtherCAT Slave Terminal cannot be connected to any of the OMRON CJ1W-NC□81/□82 Position Control Units even though they can operate as EtherCAT masters.

1-3 Model List

1-3-1 Model Notation

The Digital I/O Unit models are assigned based on the following rules.



Number	Inputs	Outputs
1	For both NPN/PNP	NPN
2	–	PNP
3	NPN	–
4	PNP	–
6	–	N.O.

Other Specifications

● Digital Input Units

Number	Input voltage	ON/OFF response time		I/O refreshing method
		Exceeds 1 µs	1 µs max.	Free-Run refreshing *1 only or Switching Synchronous I/O refreshing *2 and Free-Run refreshing
17	12 to 24 VDC or 240 VAC	Yes	–	Yes
42	24 VDC	Yes	–	Yes
43		–	Yes	Yes

*1. Free-Run refreshing

*2. Synchronous I/O refreshing

● Digital Output Units

Number	Rated voltage	Load current	ON/OFF response time		I/O refreshing method	Other functions
			Exceeds 1 µs	1 µs max.	Free-Run refreshing *1 only or Switching Synchronous I/O refreshing *2 and Free-Run refreshing	Load short-circuit protection
21	12 to 24 VDC or 240 VAC	0.5 A	Yes	–	Yes	–
33		2 A	Yes	–	Yes	–
53	24 VDC	0.5 A	–	Yes	Yes	–
56			Yes	–	Yes	Yes
57			–	Yes	Yes	Yes

*1. Free-Run refreshing

*2. Synchronous I/O refreshing

Refer to *Section 5 I/O Refreshing* for details on the I/O refreshing method.

1-3-2 Digital Input Units

This section shows the specifications for Digital Input Units.

Refer to *A-1-2 Digital Input Units* on page A-4 for details on the specifications of individual Digital Input Units.

DC Input Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Internal I/O common	Rated input voltage	I/O refreshing method	ON/OFF response time	Reference
NX-ID3317	4 points	NPN	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 µs max./400 µs max.	P. A-5
NX-ID3343			24 VDC		100 ns max./100 ns max.	P. A-6
NX-ID3417		PNP	12 to 24 VDC		20 µs max./400 µs max.	P. A-7
NX-ID3443			24 VDC		100 ns max./100 ns max.	P. A-8
NX-ID4342	8 points	NPN			20 µs max./400 µs max.	P. A-9
NX-ID4442		PNP				P. A-10
NX-ID5342	16 points	NPN				P. A-11
NX-ID5442		PNP				P. A-12

1-3-3 Digital Output Units

This section shows the specifications for Digital Output Units.

Refer to *A-1-3 Digital Output Units* on page A-13 for details on the specifications of individual Digital Output Units.

Transistor Output Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Internal I/O common	Maximum value of load current	Rated voltage	I/O refreshing method	ON/OFF response time	Reference
NX-OD3121	4 points	NPN	0.5 A/point, 2 A/Unit	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	0.1 ms max./0.8 ms max.	P. A-15
NX-OD3153				24 VDC		300 ns max./300 ns max.	P. A-16
NX-OD3256		PNP				0.5 ms max./1.0 ms max.	P. A-17
NX-OD3257						300 ns max./300 ns max.	P. A-18
NX-OD4121	8 points	NPN	0.5 A/point, 4 A/Unit	12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-19
NX-OD4256		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-20
NX-OD5121	16 points	NPN		12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-21
NX-OD5256		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-22

Relay Output Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Relay type	Maximum switching capacity	I/O refreshing method	ON/OFF response time	Reference
NX-OC2633	2 points	N.O.	250 VAC/2 A (cosΦ = 1), 250 VAC/2 A (cosΦ = 0.4), 24 VDC/2 A, 4 A/Unit	Free-Run refreshing	15 ms max./15 ms max.	P. A-23

1-4 List of Functions

This section provides an overview of functions that the Digital I/O Units have.

Refer to the specifications of each model in *A-1 Data Sheet* on page A-2 for details on the functions.

1-4-1 Digital Input Units

Function name	Description	Reference
Free-Run Refreshing	With this I/O refreshing method, the refresh cycle of the NX bus and the I/O refresh cycles of the NX Units are asynchronous.	*5-2-4 Free-Run Refreshing* on page 5-4
Synchronous I/O Refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is synchronous on a fixed interval between more than one NX Unit on more than one Slave Terminal.	*5-2-5 Synchronous Input Refreshing* on page 5-8
Input Filter	This function eliminates the chattering or the noises from input signals. It is used to prevent the error reading due to the noises. You can set the filter time constant.	*6-4-2 Input Filter* on page 6-11

1-4-2 Digital Output Units

Function name	Description	Reference
Free-Run Refreshing	With this I/O refreshing method, the refresh cycle of the NX bus and the I/O refresh cycles of the NX Units are asynchronous.	*5-2-4 Free-Run Refreshing* on page 5-4
Synchronous I/O Refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is synchronous on a fixed interval between more than one NX Unit on more than one Slave Terminal.	*5-2-6 Synchronous Output Refreshing* on page 5-12
Load Rejection Output Setting	A function that performs the preset output operation when the Digital Output Unit cannot receive output data due to a host error on the Communications Coupler Unit or an error on the NX bus.	*7-4-2 Load Rejection Output Setting* on page 7-10
Load Short-circuit Protection	A function in which the output will turn OFF to protect the output circuit when an overload or load short-circuit occurs due to a failure of the connected external devices.	*7-4-3 Load Short-circuit Protection* on page 7-16

1-5 Support Software

The following table shows the Support Software that can perform the settings of the Slave Terminal.

1-5-1 Applicable Support Software

Support Software	Version
Sysmac Studio	Ver. 1.06 or higher

Refer to the user's manual of the Communications Coupler Unit for details on connections.

2

Specifications

This section describes the general specifications and individual specifications of Digital I/O Units.

2-1 General Specifications **2-2**
2-2 Individual Specifications **2-3**

2-1 General Specifications

General specifications of Digital I/O Units are shown below.

Item		Specification
Enclosure		Mounted in a panel
Grounding methods		Ground of 100 Ω or less
Operating environment	Ambient operating temperature	0 to 55°C
	Ambient operating humidity	10 to 95% RH (with no icing or condensation)
	Atmosphere	Must be free from corrosive gases.
	Ambient storage temperature	-25 to 70°C (with no icing or condensation)
	Altitude	2,000 m max.
	Pollution degree	Pollution degree 2 or less: Conforms to JIS B3502 and IEC 61131-2.
	Noise immunity	Conforms to IEC61000-4-4, 2 kV (power supply line)
	Overvoltage category	Category II: Conforms to JIS B3502 and IEC 61131-2.
	EMC immunity level	Zone B
	Vibration resistance *1	Conforms to IEC60068-2-6. 5 to 8.4 Hz with amplitude of 3.5 mm, 8.4 to 150 Hz, acceleration of 9.8 m/s^2 100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total)
	Shock resistance *1	Conforms to IEC60068-2-27, 147 m/s^2, 3 times each in X, Y, and Z directions
	Insulation resistance	*2
	Dielectric strength	*2
Applicable standards		cULus: Listed (UL508), ANSI/ISA 12.12.01, EC: EN61131-2, C-Tick, KC: KC Registration

*1. Relay Output Unit specifications depend on the model. Refer to *A-1 Data Sheet* on page A-2 for details.

*2. Varies with NX Unit Models. Refer to *A-1 Data Sheet* on page A-2 for the specifications of individual NX Units.

2-2 Individual Specifications

Refer to *A-1 Data Sheet* on page A-2 for the specifications of individual Digital I/O Units.

3

Part Names and Functions

This section describes the names and functions of the Digital I/O Unit parts.

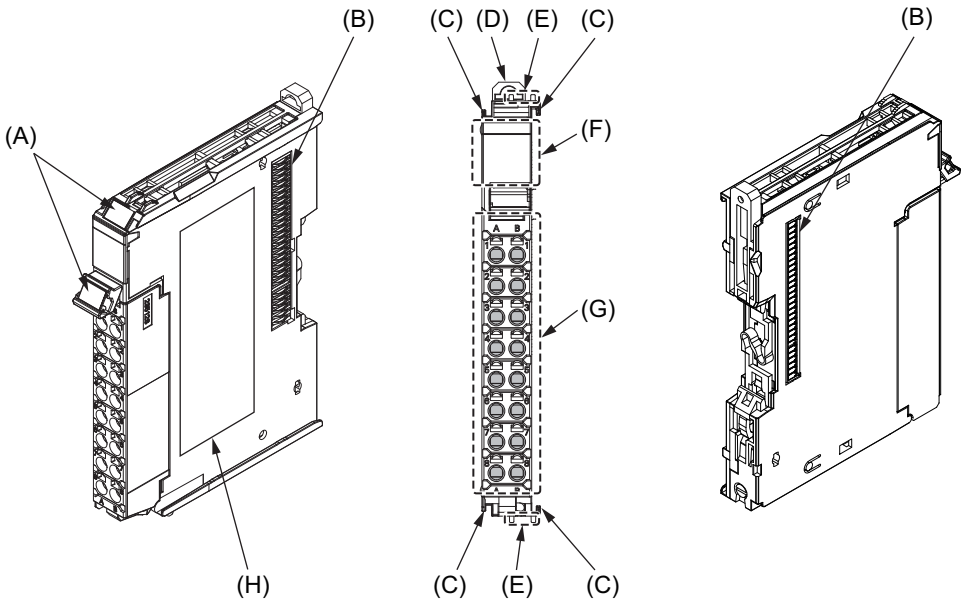
3-1 Part Names 3-2
3-1-1 Screwless Clamping Terminal Block Type 3-2
3-2 Indicators 3-4
3-2-1 TS Indicator 3-5
3-2-2 IN/OUT Indicator 3-6

3-1 Part Names

This section describes the names and functions of the Digital I/O Unit parts.

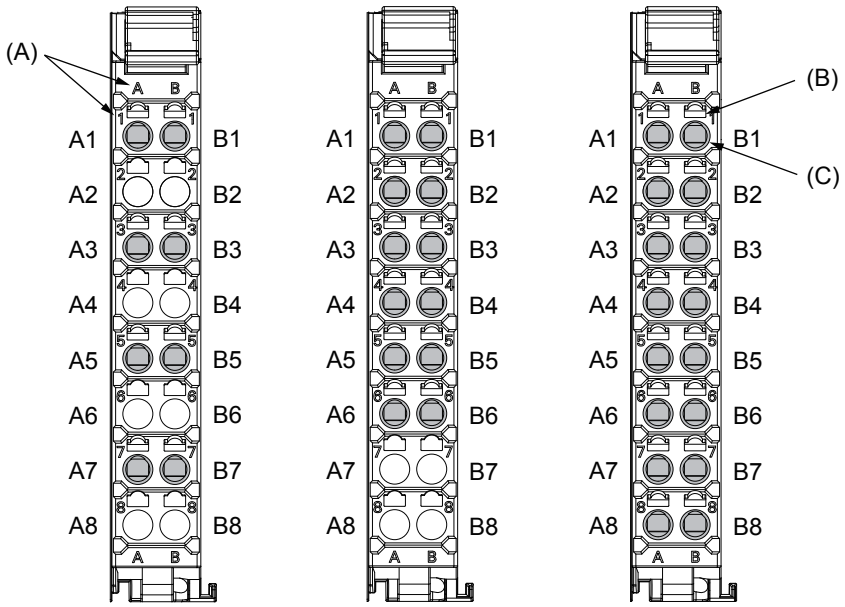
3-1-1 Screwless Clamping Terminal Block Type

12 mm Width



Letter	Name	Function
(A)	Marker attachment locations	The locations where markers are attached. The markers made by OMRON are installed for the factory setting. Commercially available markers can also be installed. Refer to *4-1-2 Attaching Markers* on page 4-4
(B)	NX bus connector	This connector is used to connect each Unit.
(C)	Unit hookup guides	These guides are used to connect two Units.
(D)	DIN Track mounting hooks	These hooks are used to mount the NX Unit to a DIN Track.
(E)	Protrusions for removing the Unit	The protrusions to hold when removing the Unit.
(F)	Indicators	The indicators show the current operating status of the Unit. Refer to *3-2 Indicators* on page 3-4
(G)	Terminal block	The terminal block is used to connect external devices. The number of terminals depends on the type of Unit.
(H)	Unit specifications	The specifications of the Unit are given.

Terminal Blocks



8-terminal type 12-terminal type 16-terminal type

Letter	Name	Function
(A)	Terminal number indications	Terminal numbers for which A and B indicate the column, and 1 to 8 indicate the line are displayed. The terminal number is a combination of column and line, i.e. A1 to A8 and B1 to B8. The terminal number indications are the same regardless of the number of terminals on the terminal block.
(B)	Release holes	Insert a flat-blade screwdriver into these holes to connect and remove the wires.
(C)	Terminal holes	The wires are inserted into these holes.

There are three types of terminal blocks for Digital I/O Units: 8-terminal type, 12-terminal type, and 16-terminal type.

Any one of the above three types of terminal block can be mounted on the Unit with a screwless clamping terminal block.

The terminal block that has a different number of terminals from the Unit specifications cannot be mounted.

Additional Information

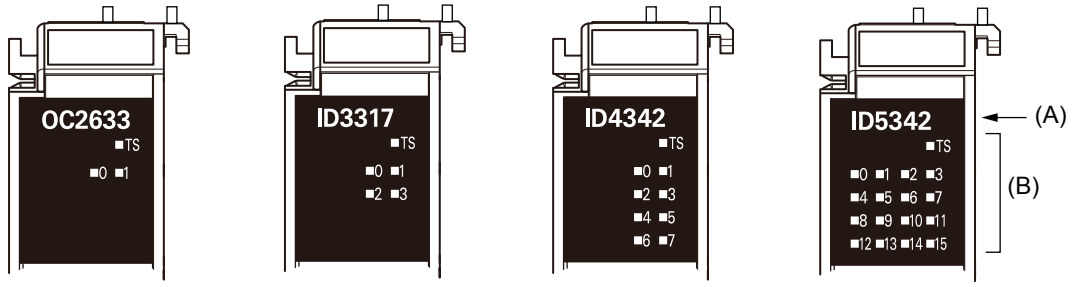
The 8-terminal type and 12-terminal type do not have terminal holes and release holes for following terminal numbers.

- 8-terminal type: A2, A4, A6, A8, B2, B4, B6, and B8
- 12-terminal type: A7, A8, B7, and B8

3-2 Indicators

There are the indicators to show the current operating status of the Unit or the signal I/O status on the Digital I/O Units.

The following indicator patterns are available depending on the number of I/O points.

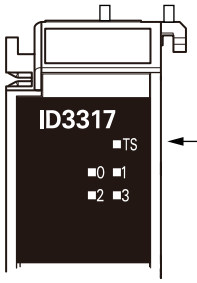


2-point type　4-point type　8-point type　16-point type

Letter	Name	Function
(A)	Model number indications	The model numbers of the NX Unit are displayed. (Example) "ID3317" in the case of NX-ID3317 The NX Units are separated in the following color depending on the type of inputs and outputs. • Digital Input Unit: Orange • Digital Output Unit: Yellow
(B)	Indicators	The indicators show the current operating status of the NX Unit or the signal I/O status.

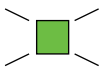
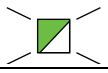
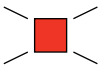
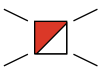
The following section describes the specifications of each indicator.

3-2-1 TS Indicator

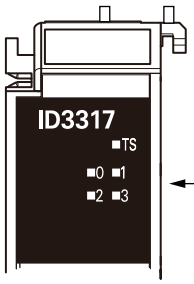


This indicator shows the current status of the Digital I/O Unit and its communications status with the Communications Coupler Unit.

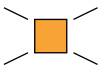
The meanings of light statuses are described as follows:

Color	Status		Description
Green		Lit	The Unit is operating normally. The Unit is ready for I/O refreshing.
		Flashing at 2-s intervals.	• Initializing • Downloading
Red		Lit	A hardware failure, WDT error, or other fatal error that is common to all I/O Units occurred.
		Flashing at 1-s intervals.	A communications error or other NX bus-related error that is common to all I/O Units occurred.
–		Not lit	• No Unit power supply • Resetting • Waiting for initialization to start

3-2-2 IN/OUT Indicator



This indicator shows the signal I/O status of each terminal of the Digital I/O Units.

Color	Status		Description
Yellow		Lit	Digital I/O is ON
-		Not lit	Digital I/O is OFF

4

Installation and Wiring

This section describes how to install the NX Units, the types of power supplies used in the Slave Terminal, their wiring methods, and how to wire the NX Units.

4-1 Installing NX Units 4-2
- 4-1-1 Installing NX Units 4-2
- 4-1-2 Attaching Markers 4-4
- 4-1-3 Removing NX Units 4-5
- 4-1-4 Installation Orientation 4-7

4-2 Wiring the Power Supply to the Slave Terminal 4-8
- 4-2-1 Power Supply Types 4-8
- 4-2-2 Supplying Each Power Supply and Wiring 4-9
- 4-2-3 Calculating the Total Current Consumption from I/O Power Supply 4-11
- 4-2-4 Power Supply-related Units for the NX-series 4-12

4-3 Wiring the Terminals 4-15
- 4-3-1 Wiring to the Screwless Clamping Terminal Block 4-15
- 4-3-2 Checking the Wiring 4-31

4-4 Wiring Examples 4-32
- 4-4-1 Wiring the Input Units (Screwless Clamping Terminal Block) 4-32
- 4-4-2 Precautions when Wiring to the Output Units (Screwless Clamping Terminal Block) 4-40

4-1 Installing NX Units

This section describes how to install NX Units.

Refer to the user's manual of the Communications Coupler Unit for information on preparations of installation and installation in a control panel.

4-1-1 Installing NX Units

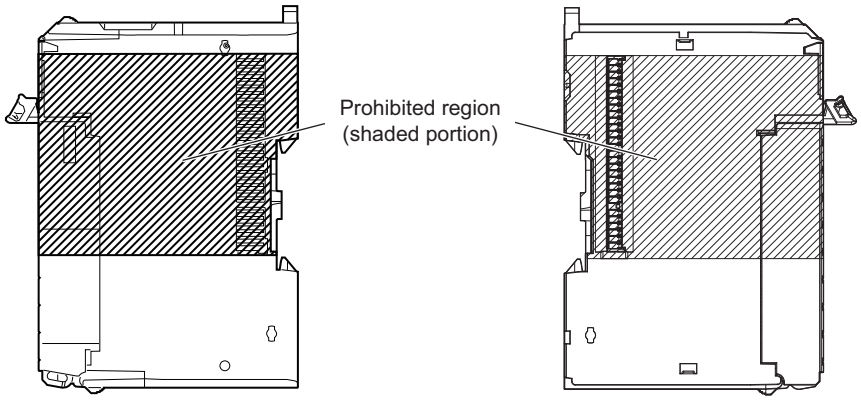
This section describes how to mount two NX Units to each other.

Always turn OFF the power supply before you mount NX Units.

Always mount NX Units one at a time. If you attempt to mount multiple NX Units that are already connected together, the connections between the NX Units may separate from each other and fall.

Precautions for Correct Use

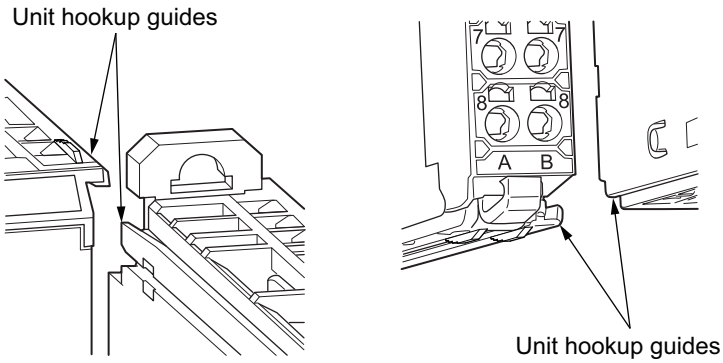
- Do not apply labels or tape on the NX Units. When the Unit is installed or removed, adhesive or scrap may adhere to the pins of the NX bus connector, which may cause malfunctions.
- Do not write with ink or soil within the prohibited region that is shown in the following figure. When the Unit is installed or removed, ink or dirt may adhere to the pins of the NX bus connector, which may cause malfunctions in the Slave Terminal.



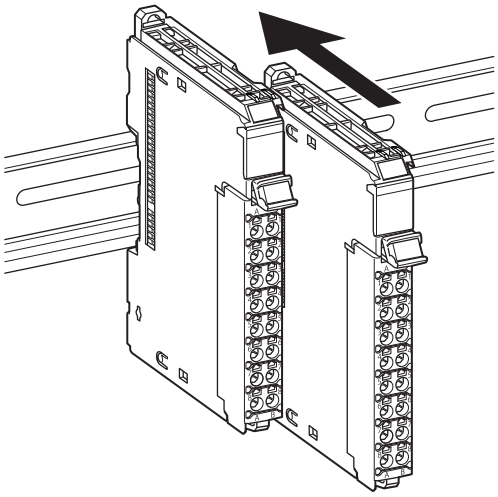
Precautions for Correct Use

- When you install an NX Unit, do not touch or bump the pins in the NX bus connector.
- When you handle an NX Unit, be careful not to apply any stress to the pins in the NX bus connector. If you install an NX Unit and turns ON the power supply when the pins in the NX bus connector are deformed, a contact defect may cause malfunctions.

1 From the front of the previously mounted NX Unit, engage the Unit hookup guides on a new Unit with the Unit hookup guides on the previously mounted NX Unit.



2 Slide the NX Unit in on the hookup guides.



3 Press the NX Unit with a certain amount of force against the DIN Track until you hear the DIN Track mounting hook lock into place.

When you mount the NX Unit, it is not necessary to release the DIN track mounting hook on the NX Unit.

After you mount the NX Unit, make sure that it is locked to the DIN Track.

Additional Information

- Normally, it is not necessary to release the DIN track mounting hook when you mount the NX Unit. However, if you mount the NX Unit on a DIN Track that is not a recommended DIN Track, the DIN track mounting hook may not lock correctly. If that happens, first unlock the DIN track mounting hook, mount the NX Unit to the DIN Track, then lock the DIN track mounting hook.
- Refer to the user's manual of the Communications Coupler Unit for information on how to mount the Communications Coupler Unit, and how to mount the NX Unit to the Communications Coupler Unit.

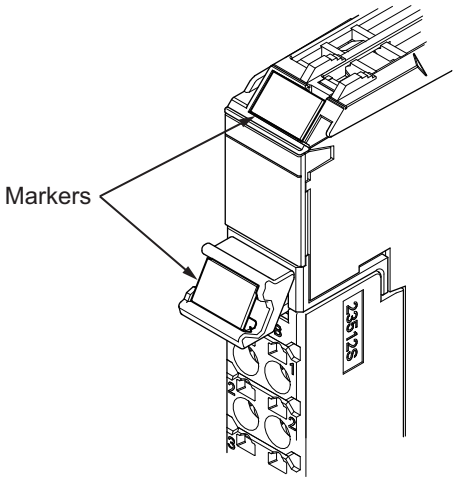
4-1-2 Attaching Markers

Markers can be attached to the NX Units and terminal blocks on NX Units to identify them.

The plastic markers made by OMRON are installed for the factory setting. The ID information can be written on them.

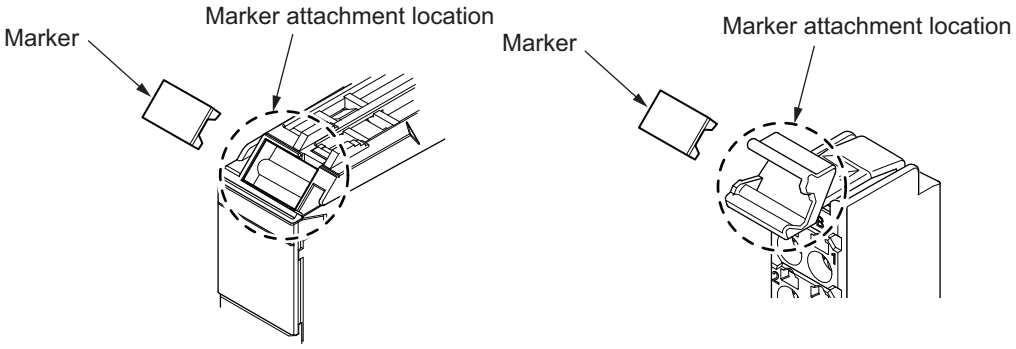
Commercially available markers can also be installed.

Replace the markers made by OMRON if you use commercially available markers now.



● Installation Method

Insert the protrusions on the markers into the marker attachment locations on the NX Units and terminal blocks on NX Units.



<NX Unit> <Terminal Block>

● Commercially Available Markers

Commercially available markers are made of plastic and can be printed on with a special printer.

To use commercially available markers, purchase the following products.

Product name	Model number	
	Manufactured by Phoenix Contact	Manufactured by Weidmuller
Markers	UC1-TMF8	DEK 5/8
Special marker printer	UM EN BLUEMARK X1	PrintJet PRO

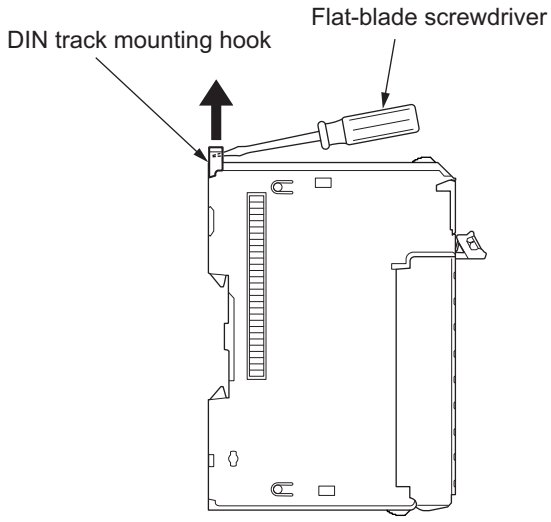
The markers made by OMRON cannot be printed on with commercially available special printers.

4-1-3 Removing NX Units

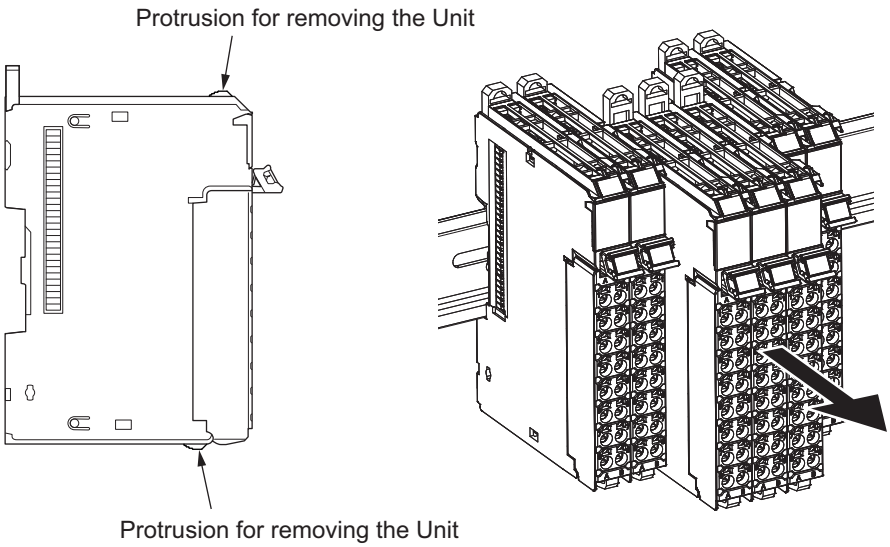
Precautions for Safe Use

Always turn OFF the Unit power supply and I/O power supply before you remove the NX Unit.

1 Use a flat-blade screwdriver to pull up the DIN Track mounting hook on the Unit to remove.



2 Put your fingers on the protrusions for removing multiple NX Units including the Unit to be removed, then pull out straight forward to remove.



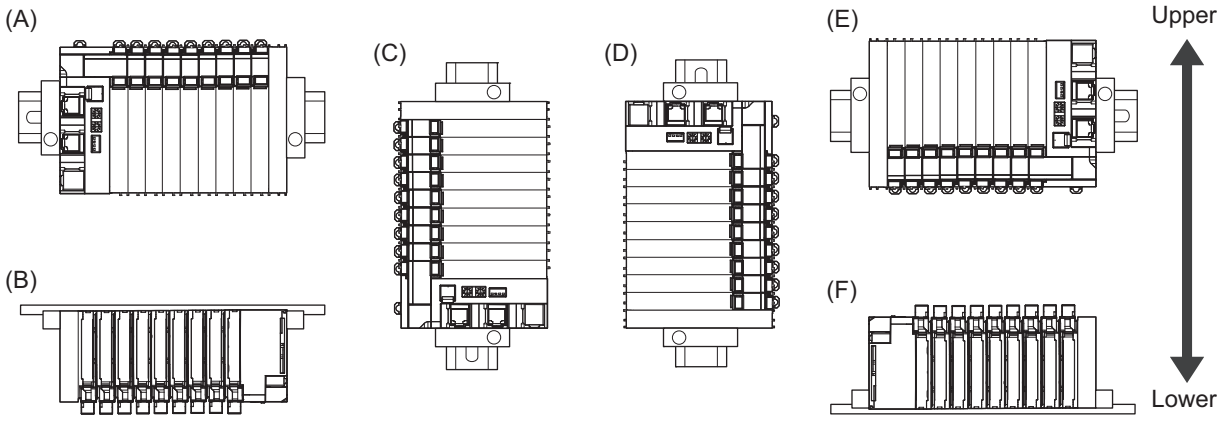
Precautions for Correct Use

- When removing an NX Unit, remove multiple Units together which include the one you want to remove. If you attempt to remove only one Unit, it is stuck and hard to pull out.
- Do not unlock the DIN track mounting hooks on all of the NX Units at the same time. If you unlock the DIN Track mounting hooks on all of the NX Units at the same time, all of the Units may come off.

4-1-4 Installation Orientation

Orientation is possible in the following six directions.

(A) is the upright orientation and (B) to (F) are other orientations.



However, there are restrictions on the installation orientation and restrictions to specifications that can result from the Communications Coupler Units and NX Units that are used.

Refer to the user's manuals for the Communications Coupler Units, NX Units and System Units that you will use for details on restrictions.

Precautions for Safe Use

For installation orientations (C) and (D) in the above figure, support the cables, e.g., with a duct, so that the End Plate on the bottom is not subjected to the weight of the cables.The weight of the cables may cause the bottom End Plate to slide downward so that the Slave Terminal is no longer secured to the DIN Track, which may cause malfunctions.

4-2 Wiring the Power Supply to the Slave Terminal

This section describes how to supply power to the Slave Terminal and wiring.

4-2-1 Power Supply Types

There are the following two types of power supplies that supply power to the Slave Terminal.

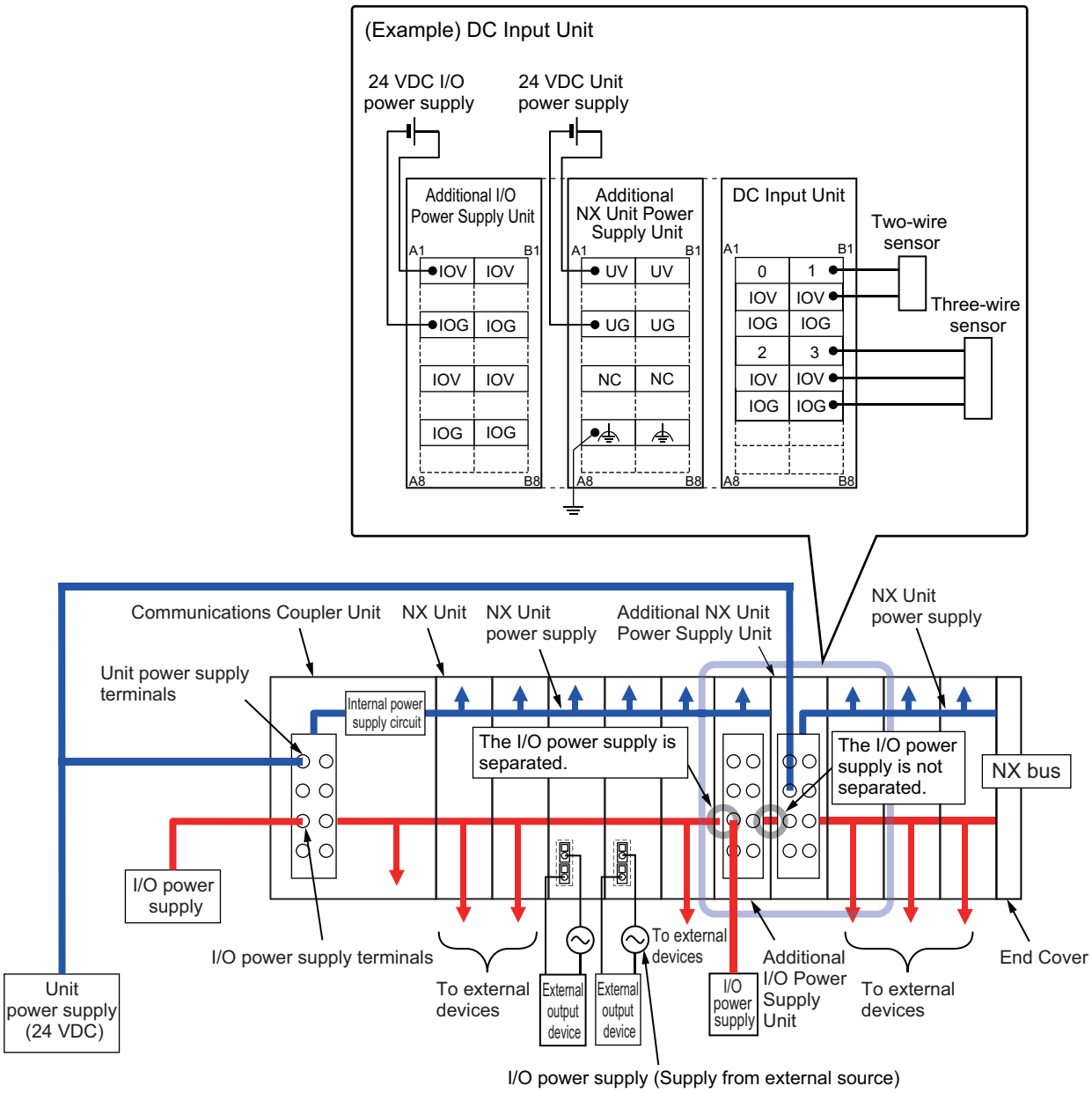
Power supply name	Description
Unit power supply	This is the power supply for generating the NX Unit power supply required for the Slave Terminal to operate. This is connected to the Unit power supply terminal on the Communications Coupler Unit or on the Additional NX Unit Power Supply Unit. The internal power supply circuit in the Communications Coupler Unit or the Additional NX Unit Power Supply Unit generates the NX Unit power supply from the Unit power supply. The internal circuits of the Communications Coupler Unit and NX Units operate by the NX Unit power supply. The NX Unit power supply is supplied to the NX Units in the Slave Terminal through the NX bus connectors.
I/O power supply	This power supply is used for driving the I/O circuits of the NX Units and for the connected external devices. This is connected to the I/O power supply terminal on the Communications Coupler Unit or the Additional I/O Power Supply Unit. The I/O power supply is used for the following applications. • I/O circuits operations in the Digital I/O Units • Input current in a Digital Input Unit • Load current of the external load of a Digital Output Unit • Power supply for the connected external devices The I/O power supply is supplied to the NX Units from the I/O power supply terminals and through the NX bus connectors.

4-2-2 Supplying Each Power Supply and Wiring

The supply method for each power supply to the NX Units is as follows.

Power supply name	Description
NX Unit power supply	This power is supplied to the NX Units through the NX bus connectors by connecting a Unit power supply to the Unit power supply terminals on the Communications Coupler Unit or Additional NX Unit Power Supply Units.
I/O power supply	This power is supplied by one of the following two methods. Refer to *A-1 Data Sheet* on page A-2 for the supply method of each NX Unit. • Supply from the NX bus This power is supplied through the NX bus connectors by connecting an I/O power supply to the I/O power supply terminals on the Communications Coupler Unit or Additional I/O Power Supply Units. • Supply from external source This power is supplied to the Units from an external source. I/O power is supplied by connecting an I/O power supply to the I/O power supply terminals on the Units.

The following are wiring diagrams (examples) for each power supply.



Precautions for Correct Use

Always use separate power supplies for the Unit power supply and the I/O power supply. If you supply power from the same power supply, noise may cause malfunctions.

Additional Information

Refer to the user's manual for the Communications Coupler Unit on design for power supply to the Slave Terminal.

4-2-3 Calculating the Total Current Consumption from I/O Power Supply

The total current consumption of I/O power supplied from the NX bus must be within the range of the maximum I/O power supply current of the Communications Coupler Unit or the Additional I/O Power Supply Unit.

To confirm this and to calculate the I/O power supply capacity, calculate the total current consumption from I/O power supply from the NX bus.

The total current consumption from I/O power supply from the NX bus is the total sum of current consumption from I/O power supply of the NX Unit that supplies the I/O power from the NX bus, the current consumption of each applicable I/O circuit, and current consumption of any connected external devices.

Note that the current consumption from I/O power supply indicated in the data sheet for each Unit type does not include the load current of any external connection load and current consumption of any connected external devices.

The total current consumption from I/O power supply of the Digital I/O Units is calculated as follows.

- **Total Current Consumption from I/O Power Supply of the Digital Input Units**

  = (Current consumption from I/O power supply of the Digital Input Units) + (Input current of the Digital Input Units × Number of input points used) + (Total current consumption of connected external devices)

- **Total Current Consumption from I/O Power Supply of the Digital Output Units**

  = (Current consumption from I/O power supply of the Digital Output Units) + (Total load current of connection load) + (Total current consumption of connected external devices)

Refer to *A-1 Data Sheet* on page A-2 for the current consumption from I/O power supply for each Digital I/O Unit model and input current for each Digital Input Unit model.

There are no above confirmations if you use the NX Unit that supplies the I/O power from external source.

Use the total current consumption from I/O power supply from external source and the total current consumption from the I/O power supply from the above NX bus together to calculate the I/O power supply capacity.

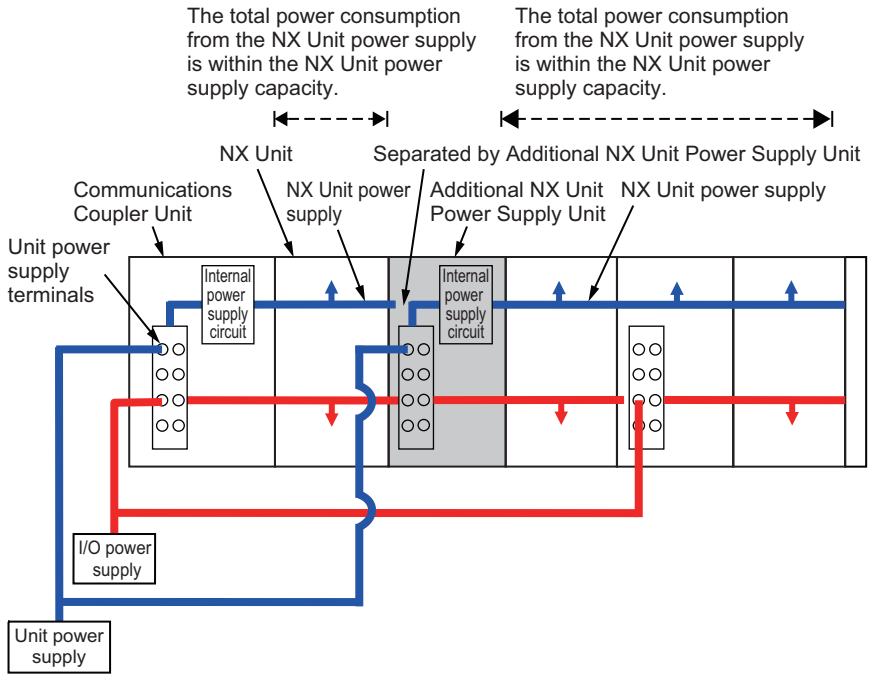
4-2-4 Power Supply-related Units for the NX-series

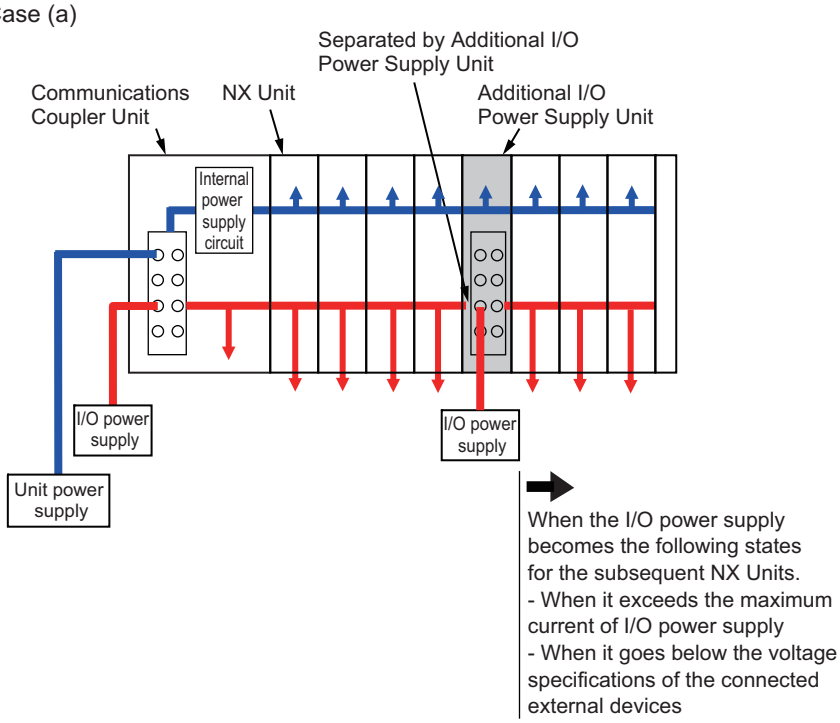
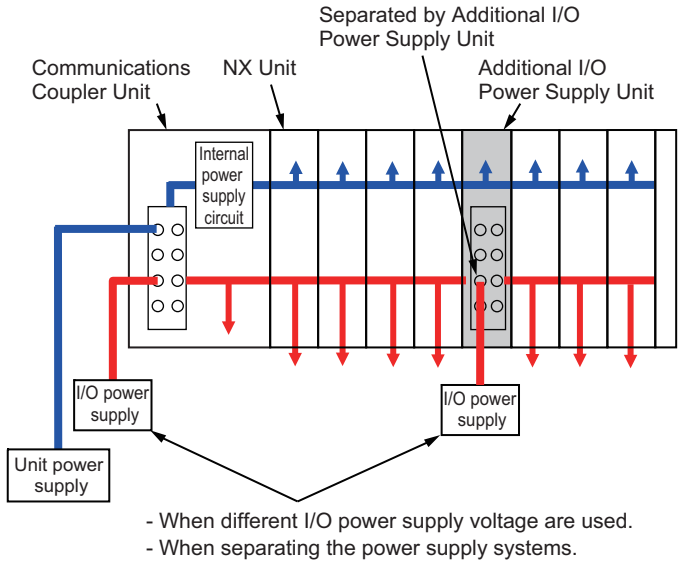
A Communications Coupler Unit supplies the NX Unit power supply and I/O power supply to the NX Units in the Slave Terminal.

There are the following types of NX-series power supply-related Units other than Communications Coupler Units.

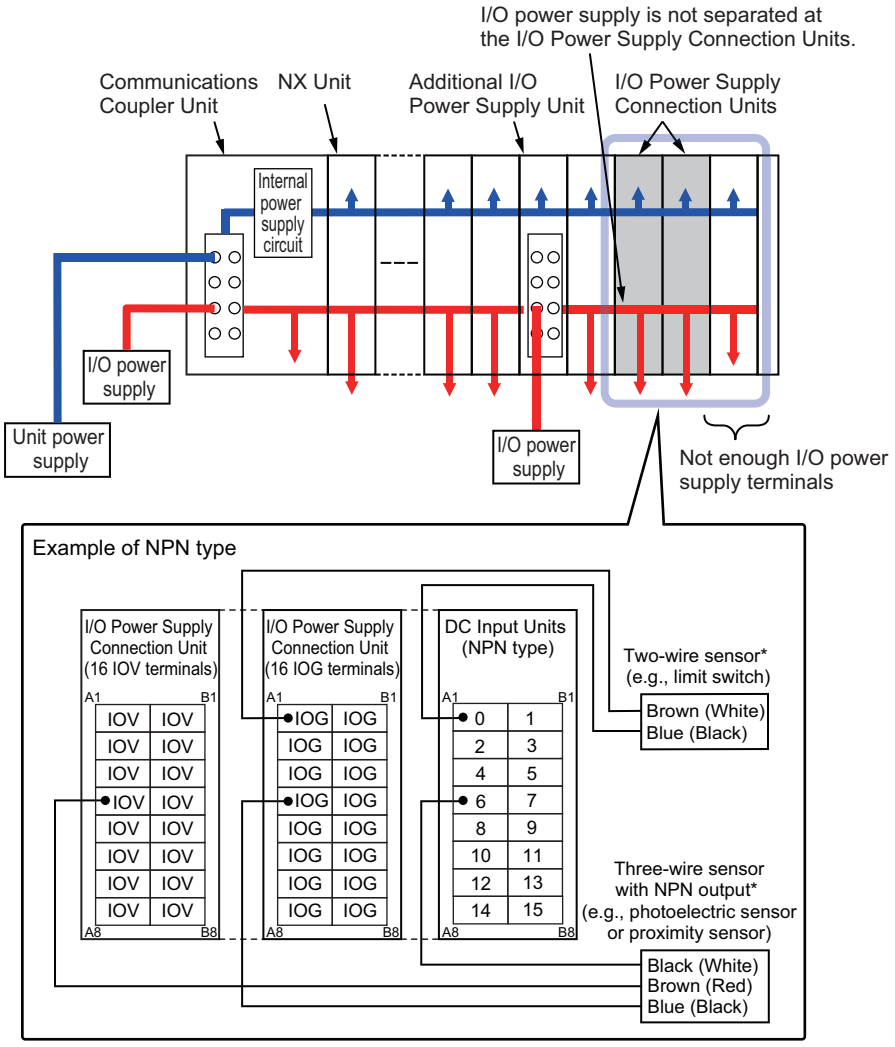
Refer to the *NX-series System Unit User's Manual* (Cat. No. W523) for details on NX-series power supply-related Units.

Refer to NX-series catalogs or OMRON websites, or ask your OMRON representative for information on the most recent lineup of NX Units.

Unit name	Function
Additional NX Unit Power Supply Unit	This NX Unit provides NX Unit power supply. This NX Unit is used when the total power consumption of the NX Units in the Slave Terminal exceeds the NX Unit power supply capacity of the Communications Coupler Unit.  The I/O power supply for the Additional NX Unit Power Supply Unit is connected to the NX Unit on the left through the NX bus connector.

Unit name	Function
Additional I/O Power Supply Unit	This NX Unit provides additional I/O power supply. Use this NX Unit in the following cases. (a) When the I/O power supply capacity is insufficient • When the total current consumption for the I/O power supply exceeds the maximum current of I/O power supply of the Communications Coupler Unit • When a voltage drop in the I/O power supply causes the voltage of the I/O power supply to go below the voltage specifications of the I/O circuits or connected external devices (b) Separating the I/O power supply • When connected external devices have different I/O power supply voltages • When separating the power supply systems Case (a)  Case (b)  The NX Unit power supply of the Additional I/O Power Supply Unit is connected to the NX Unit on the left through the NX bus connector.

Unit name	Function
I/O Power Supply Connection Unit	This NX Unit is used when there are not enough I/O power supply terminals for the connected external devices that are connected to NX Units such as Digital I/O Units and Analog I/O Units.


I/O power supply is not separated at the I/O Power Supply Connection Units.
Communications Coupler Unit
NX Unit
Additional I/O Power Supply Unit
I/O Power Supply Connection Units
Internal power supply circuit
I/O power supply
Unit power supply
I/O power supply
Not enough I/O power supply terminals
Example of NPN type
I/O Power Supply Connection Unit (16 IOV terminals)
I/O Power Supply Connection Unit (16 IOG terminals)
DC Input Units (NPN type)
Two-wire sensor* (e.g., limit switch)
Brown (White)
Blue (Black)
Three-wire sensor with NPN output* (e.g., photoelectric sensor or proximity sensor)
Black (White)
Brown (Red)
Blue (Black)

* Wire colors have been changed according to revisions in the JIS standards for photoelectric and proximity sensors. The colors in parentheses are the wire colors prior to the revisions.

4-3 Wiring the Terminals

This section describes how to wire the terminals on the Digital I/O Units.

⚠ WARNING

Do not input a voltage or current that exceeds the specified range into a Unit or slave.

If a voltage or current that is outside the specified range is input, the Unit or slave may fail or a fire may occur.

4-3-1 Wiring to the Screwless Clamping Terminal Block

This section describes how to connect wires to the screwless clamping terminal block, the installation and removing methods, and functions for preventing incorrect attachment.

You can connect ferrules that are attached to the twisted wires to the screwless clamping terminal block. You can also connect the twisted wires or the solid wires to the screwless clamping terminal block. If you connect the ferrules, all you need to do to connect the wires is to insert the ferrules into the terminal holes.

Wiring Terminals

The terminals to be wired are as follows.

- I/O power supply terminals
- I/O terminals

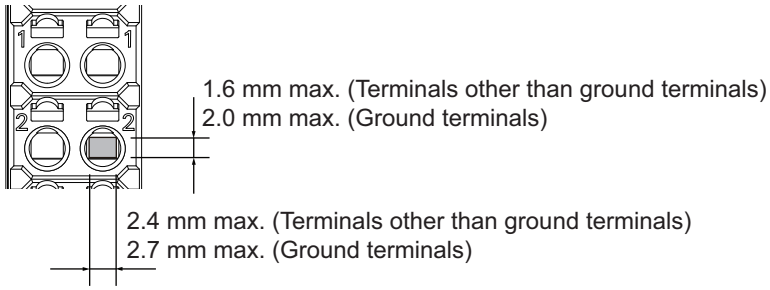
Applicable Wires

The wires that you can connect to the screwless clamping terminal block are twisted wires, solid wires, and ferrules that are attached to the twisted wires. The following section describes the dimensions and processed methods for applicable wires.

● Dimensions of Wires Connected to the Terminal Block

The dimensions of wires that you can connect into the terminal holes of the screwless clamping terminal block are as in the figure below.

Process the applicable wires that are specified in the following description to apply the dimensions.



Using Ferrules

If you use ferrules, attach the twisted wires to them.

Observe the application instructions for your ferrules for the wire stripping length when attaching ferrules.

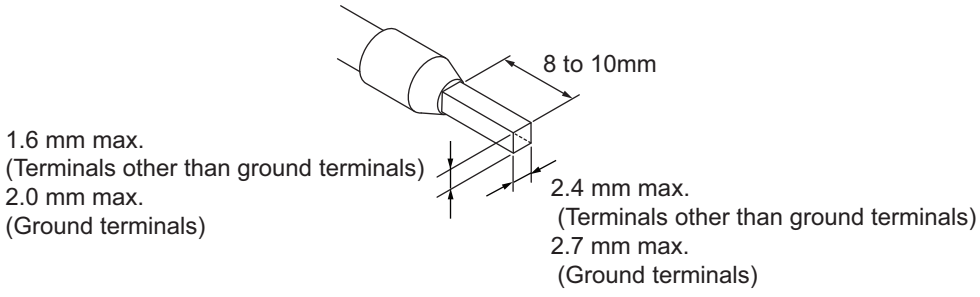
Always use one-pin ferrules. Do not use two-pin ferrules.

The applicable ferrules, wires, and crimping tools are listed in the following table.

Terminal types	Manufacturer	Ferrule model	Applicable wire (mm^2 (AWG))	Crimping tool
Terminals other than ground terminals	Phoenix Contact	AI0,34-8	0.34 (#22)	Phoenix Contact (The figure in parentheses is the applicable wire size.) CRIMPFOX 6 (0.25 to 6 mm^2, AWG24 to 10)
		AI0,5-8	0.5 (#20)	
		AI0,5-10		
		AI0,75-8	0.75 (#18)	
		AI0,75-10		
		AI1,0-8	1.0 (#18)	
		AI1,0-10		
		AI1,5-8	1.5 (#16)	
		AI1,5-10		
Ground terminals		AI2,5-10	2.0 *1	
Terminals other than ground terminals	Weidmuller	H0.14/12	0.14 (#26)	Weidmuller (The figure in parentheses is the applicable wire size.) PZ6 Roto (0.14 to 6 mm^2, AWG26 to 10)
		H0.25/12	0.25 (#24)	
		H0.34/12	0.34 (#22)	
		H0.5/14	0.5 (#20)	
		H0.5/16		
		H0.75/14	0.75 (#18)	
		H0.75/16		
		H1.0/14	1.0 (#18)	
		H1.0/16		
		H1.5/14	1.5 (#16)	
		H1.5/16		

*1. Some AWG14 wires exceed 2.0 mm^2 and cannot be used in the screwless clamping terminal block.

When you use any ferrules other than those in the above table, crimp them to the twisted wires so that the following processed dimensions are achieved.

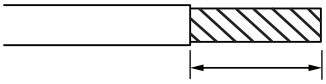


Using Twisted Wires/Solid Wires

If you use the twisted wires or the solid wires, the applicable wire range and conductor length (stripping length) are as follows.

Use the twisted wires to connect the ground wire to a ground of 100 Ω or less. Do not use the solid wires.

Terminal types	Applicable wire range	Conductor length (stripping length)
Ground terminals	2.0 mm^2	9 to 10 mm
Terminals other than ground terminals	0.08 to 1.5 mm^2 AWG28 to 16	8 to 10 mm

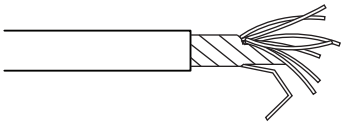


Conductor length (stripping length)

Precautions for Correct Use

- Use cables with suitable wire sizes for the carrying current. There are also restrictions on the current due to the ambient temperature. Refer to the manuals for the cables and use the cables correctly for the operating environment.
- For twisted wires, strip the sheath and twist the conductor portion. Do not unravel or bend the conductor portion of twisted wires or solid wires.

NG



Unravel wires

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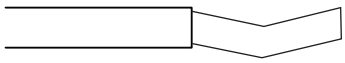
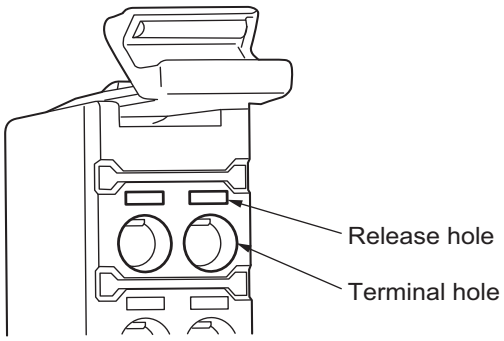


Bend wires

Connecting/Removing Wires

This section describes how to connect and remove wires.

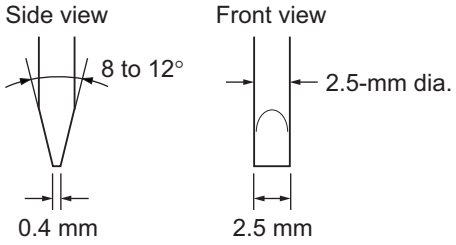
● Terminal Block Parts and Names



● Required Tools

Use a flat-blade screwdriver to connect and remove wires.

Use the following flat-blade screwdriver.



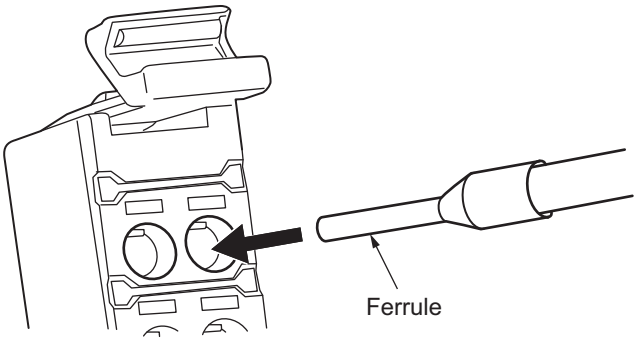
Recommended screwdriver

Model	Manufacturer
SZF0	Phoenix Contact

Connecting Ferrules

Insert the ferrule straight into the terminal hole.

It is not necessary to press a flat-blade screwdriver into the release hole.



After you make a connection, make sure that the ferrule is securely connected to the terminal block.

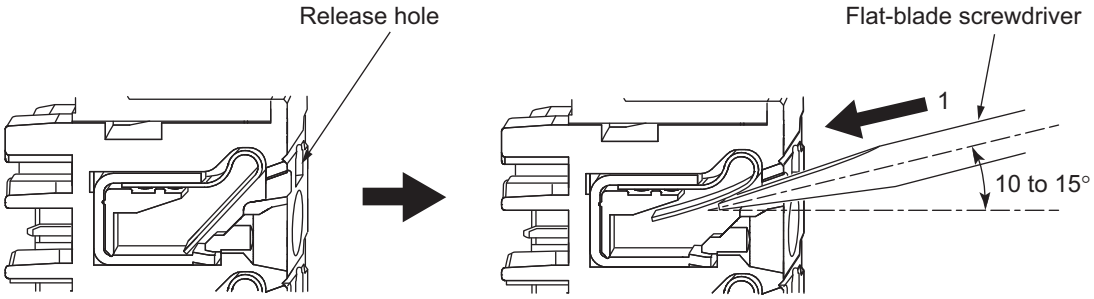
Connecting Twisted Wires/Solid Wires

Use the following procedure to connect the twisted wires or solid wires to the terminal block.

1 Press the a flat-blade screwdriver diagonally into the release hole.

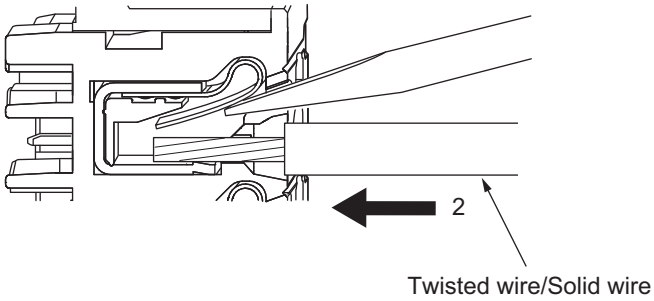
Press at an angle of 10° to 15°.

If you press in the screwdriver correctly, you will feel the spring in the release hole.

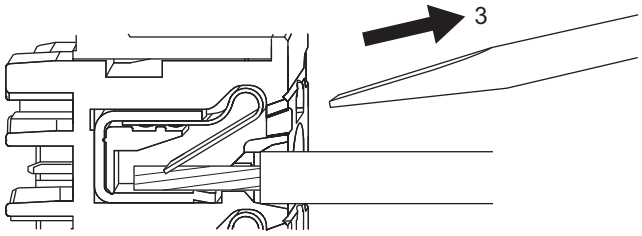


2 Leave the flat-blade screwdriver pressed into the release hole and insert the twisted wire or the solid wire into the terminal hole.

Insert the twisted wire or the solid wire until the stripped portion is no longer visible to prevent shorting.



3 Remove the flat-blade screwdriver from the release hole.

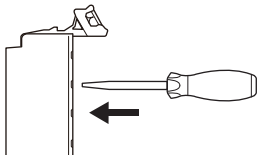


After you make a connection, make sure that the twisted wire or the solid wire is securely connected to the terminal block.

Precautions for Safe Use

- Do not press the flat-blade screwdriver straight into the release hole. Doing so may break the terminal block.

NG



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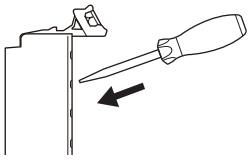
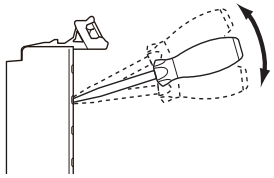


- When you insert a flat-blade screwdriver into a release hole, press it down with a force of 30 N max. Applying excessive force may damage the terminal block.
- Do not tilt or twist the flat-blade screwdriver while it is pressed into the release hole. Doing so may break the terminal block.

NG



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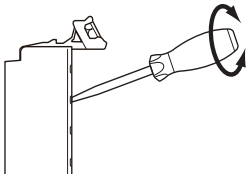


- Make sure that all wiring is correct.
- Do not bend the cable forcibly. Doing so may sever the cable.

● Removing Wires

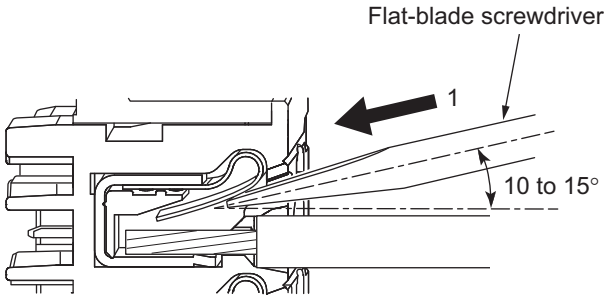
Use the following procedure to remove the wires from the terminal block.

The removal method is the same for ferrules, twisted wires, and solid wires.

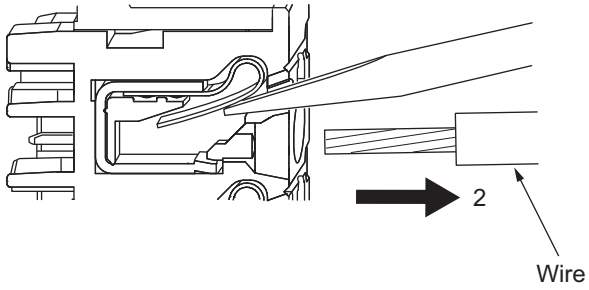
1 Press the flat-blade screwdriver diagonally into the release hole.

Press at an angle of 10° to 15°.

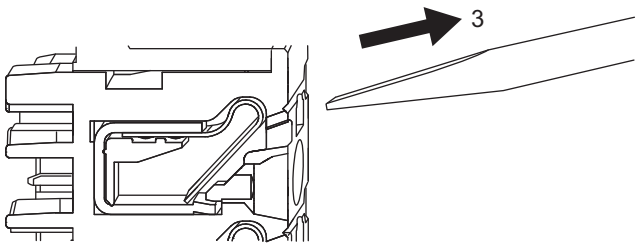
If you press in the screwdriver correctly, you will feel the spring in the release hole.



2 Leave the flat-blade screwdriver pressed into the release hole and pull out the wire.



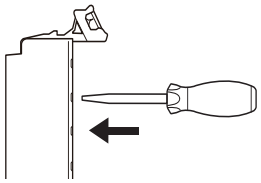
3 Remove the flat-blade screwdriver from the release hole.



Precautions for Safe Use

- Do not press the flat-blade screwdriver straight into the release hole. Doing so may break the terminal block.

NG



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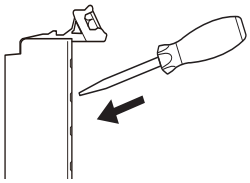
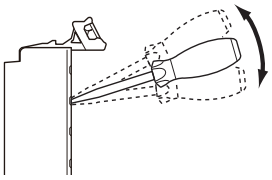


- When you insert a flat-blade screwdriver into a release hole, press it down with a force of 30 N max. Applying excessive force may damage the terminal block.
- Do not tilt or twist the flat-blade screwdriver while it is pressed into the release hole. Doing so may break the terminal block.

NG



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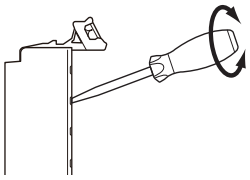
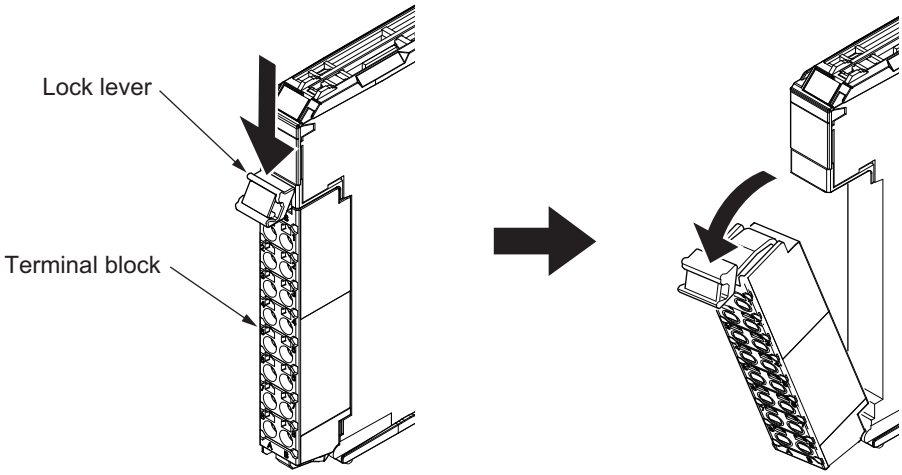


- Make sure that all wiring is correct.
- Do not bend the cable forcibly. Doing so may sever the cable.

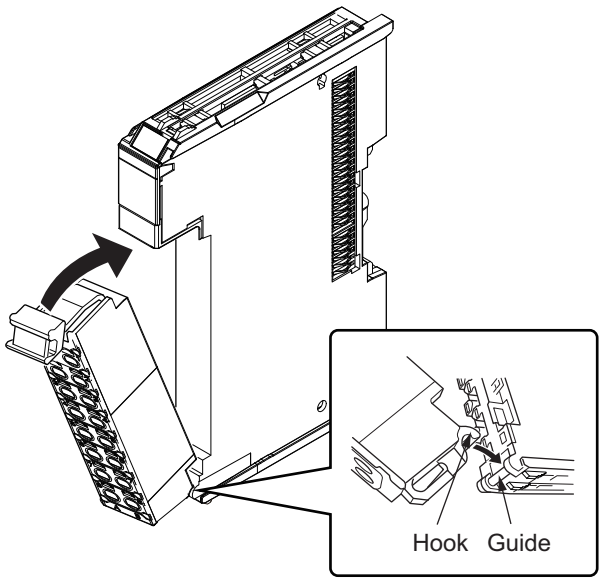
Removing a Terminal Block

1 Press the lock lever on the terminal block and pull out the top of the terminal block to remove it.



Attaching a Terminal Block

1 Place the terminal block hook on the guide at the bottom of the NX Unit and press in on the top of the terminal block to attach it.



There are three types of terminal blocks for Digital I/O Units: 8-terminal type, 12-terminal type, and 16-terminal type.

Any one of the above three types of terminal block can be mounted on the Unit with a screwless clamping terminal block.

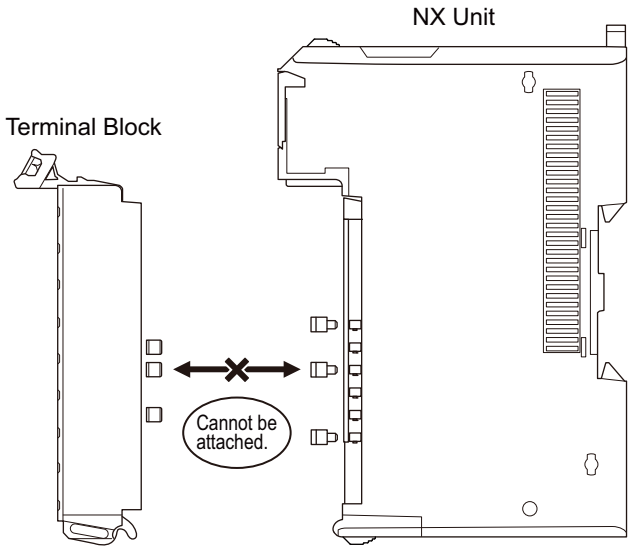
The terminal block that has a different number of terminals from the Unit specifications cannot be mounted.

Preventing Incorrect Attachment of Terminal Blocks

In order to prevent unintentionally installing the wrong terminal block, you can limit the combination of a Unit and a terminal block.

Insert three Coding Pins (NX-AUX02) into three of the six incorrect attachment prevention holes on the Unit and on the terminal block. Insert these pins into positions so that they do not interfere with each other when the Unit and terminal block are connected to each other.

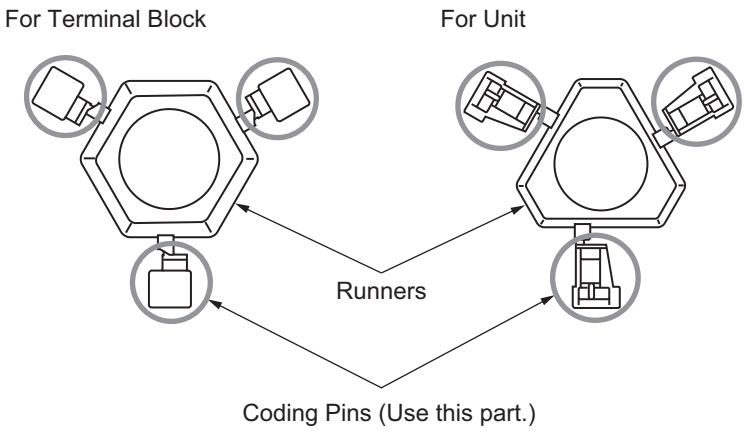
You can use these pins to create a combination in which the wrong terminal block cannot be attached because the pin patterns do not match.



Types of Coding Pins

There are two types of Coding Pins, both with their own unique shape: one for terminal blocks and one for Units.

Three pins come with each runner.



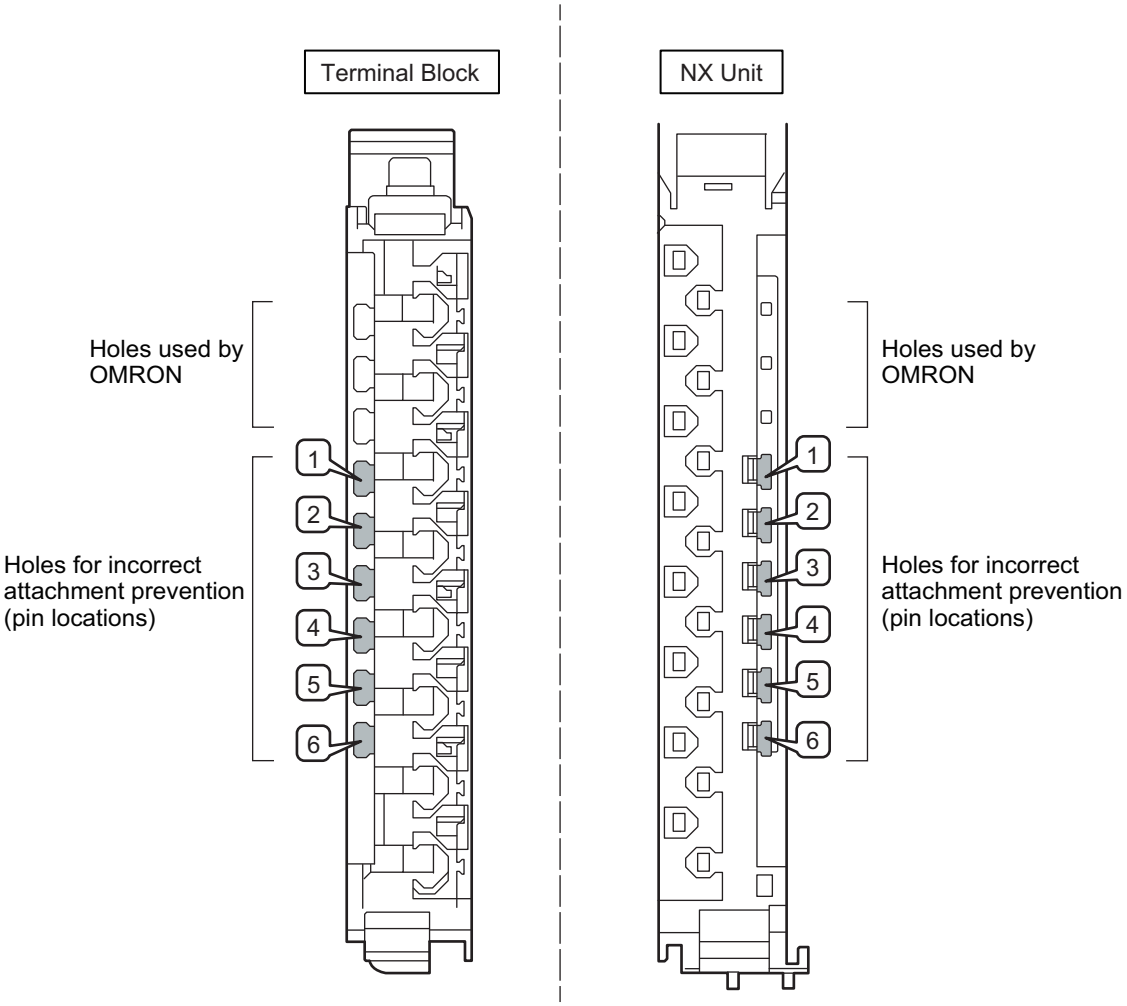
Use the following Coding Pins.

Name	Model	Specification
Coding Pin	NX-AUX02	For 10 Units (Terminal Block: 30 pins, Unit: 30 pins)

● Insertion Locations and Patterns of Coding Pins

Insert three Coding Pins of each on the terminal block and on the Unit at the positions designated by the numbers 1 through 6 in the figure below.

As shown in the following table, there are 20 unique pin patterns that can be used.



○: Pin inserted

Pattern	Pin locations for Terminal Block						Pin locations for NX Unit					
	1	2	3	4	5	6	1	2	3	4	5	6
No.1	○	○	○							○	○	○
No.2	○	○		○					○		○	○
No.3	○	○			○				○	○		○
No.4	○	○				○			○	○	○	
No.5	○		○	○				○			○	○
No.6	○		○		○			○		○		○
No.7	○		○			○		○		○	○	
No.8	○			○	○			○	○			○
No.9	○			○		○		○	○		○	
No.10	○				○	○		○	○	○		
No.11		○	○	○			○				○	○
No.12		○	○		○		○			○		○
No.13		○	○			○	○			○	○	
No.14		○		○	○		○		○			○
No.15		○		○		○	○		○		○	
No.16		○			○	○	○		○	○		
No.17			○	○	○		○	○				○
No.18			○	○		○	○	○			○	
No.19			○		○	○	○	○		○		
No.20				○	○	○	○	○	○			

To make the maximum of 20 patterns, purchase two sets of NX-AUX02 Pins. (One set for 10 Units.)

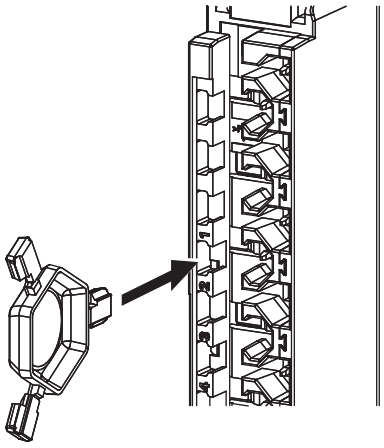
Precautions for Correct Use

OMRON uses the holes other than No. 1 to 6 in the figure on the previous page. If you insert a Coding Pin into one of the holes used by OMRON on the terminal block side, this makes it impossible to mount the terminal block on a Unit.

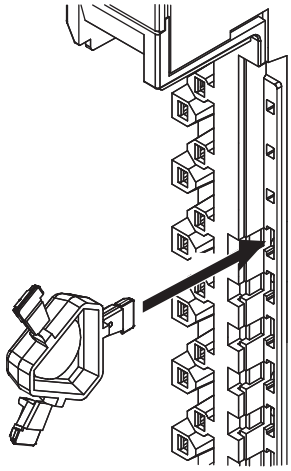
● Inserting the Coding Pins

1 Hold the pins by the runner and insert a pin into one of the incorrect attachment prevention holes on the terminal block or on the Unit.

Terminal Block

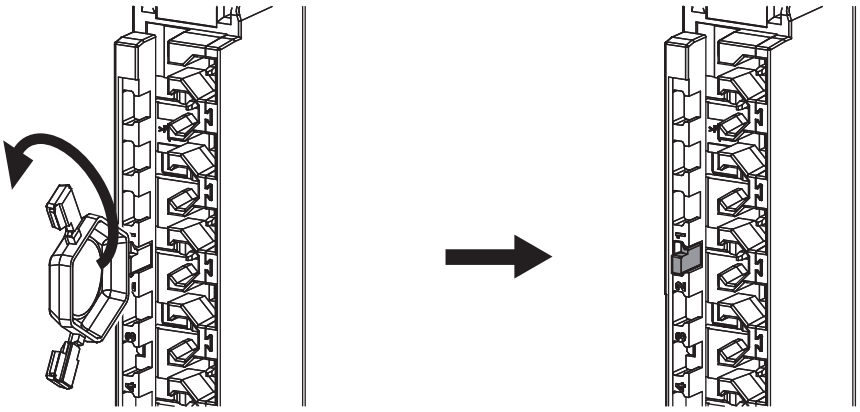


Unit

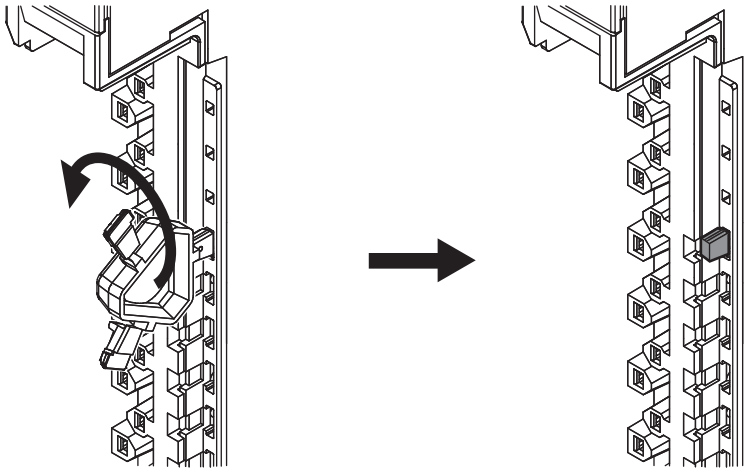


2 Rotate the runner to break off the Coding Pin.

Terminal Block



Unit



4-3-2 Checking the Wiring

Check the wiring from the I/O Map or Watch Tab Page of the Sysmac Studio.

For Input Units, you can turn ON/OFF the inputs from external devices that are connected to the target Units and monitor the results.

For Output Units, you can refresh the I/O outputs of the target Units with the specified values by forced refreshing, and check the operation of the connected external devices.

If you use the I/O Map, you can also monitor and perform forced refreshing even if does not define the variables and create the algorithms. Therefore, you can easily check the wiring.

Refer to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for details on monitoring and forced refreshing operations.

4-4 Wiring Examples

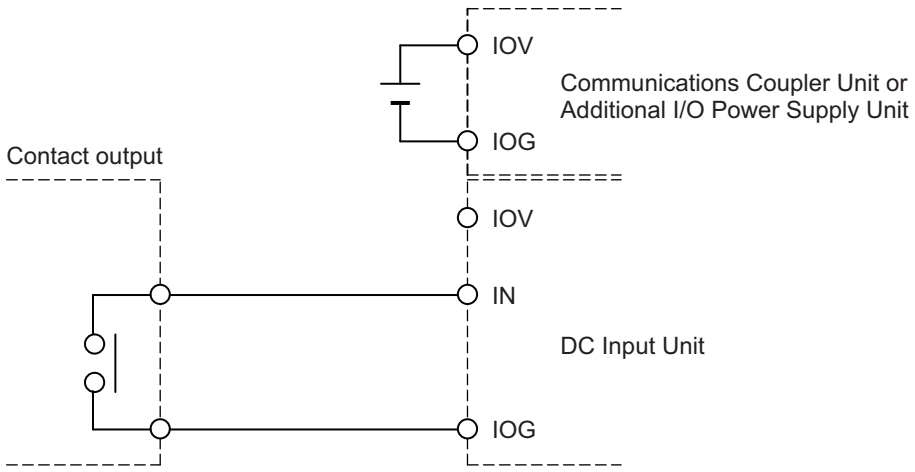
This section gives some wiring examples for the Digital I/O Units and precautions for wiring.

4-4-1 Wiring the Input Units (Screwless Clamping Terminal Block)

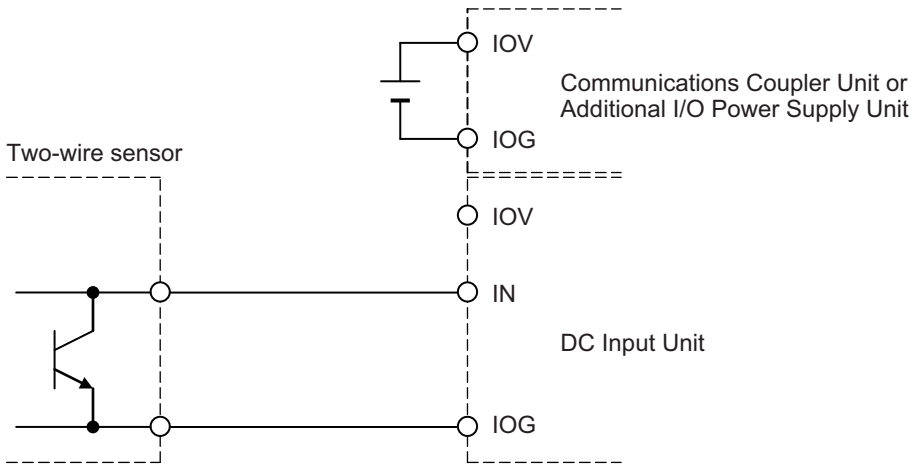
Wiring to the DC Input Units

● NPN Type Input Units

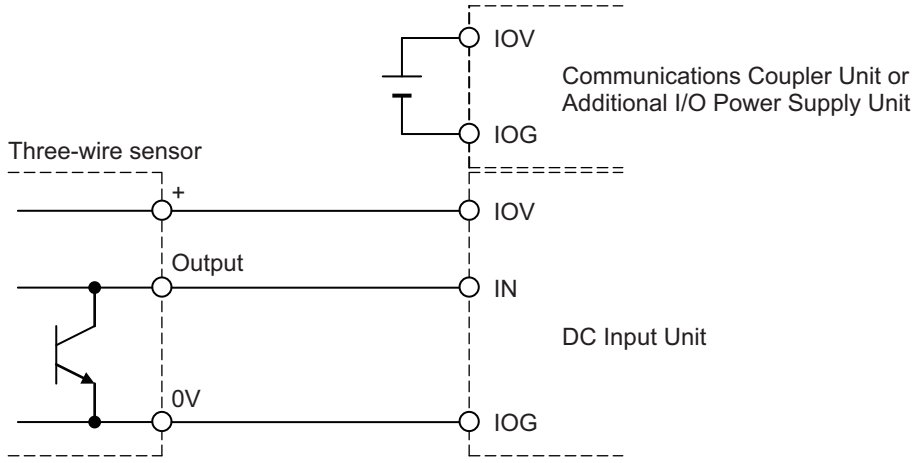
This is the wiring for contact output type external devices.



This is the wiring for two-wire sensors.

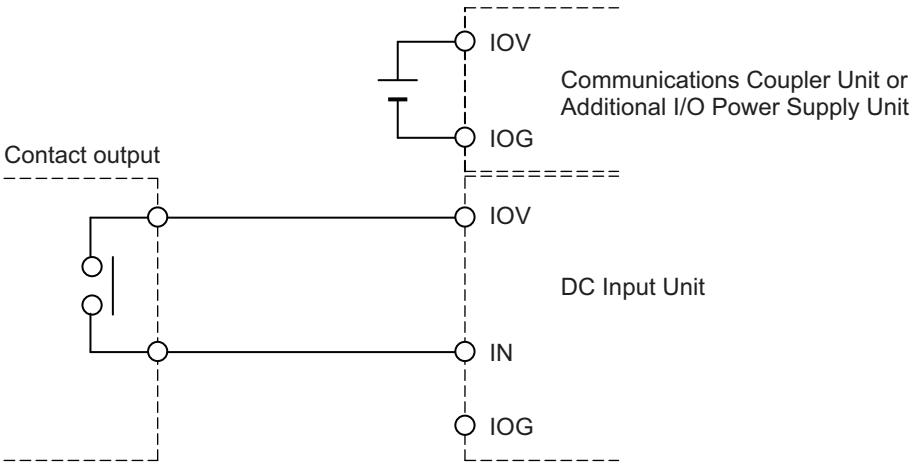


This is the wiring for three-wire sensors.

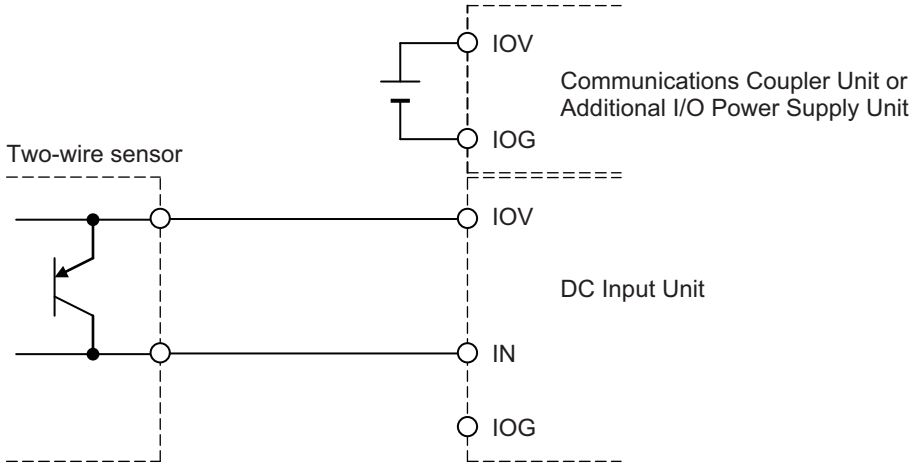


● PNP Type Input Units

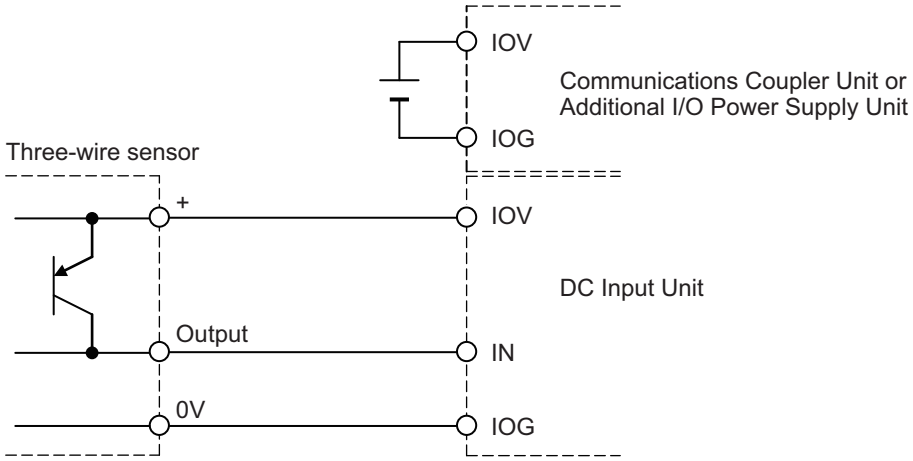
This is the wiring for contact output type external devices.



This is the wiring for two-wire sensors.



This is the wiring for three-wire sensors.



● Precautions when Connecting a Two-wire DC Sensor

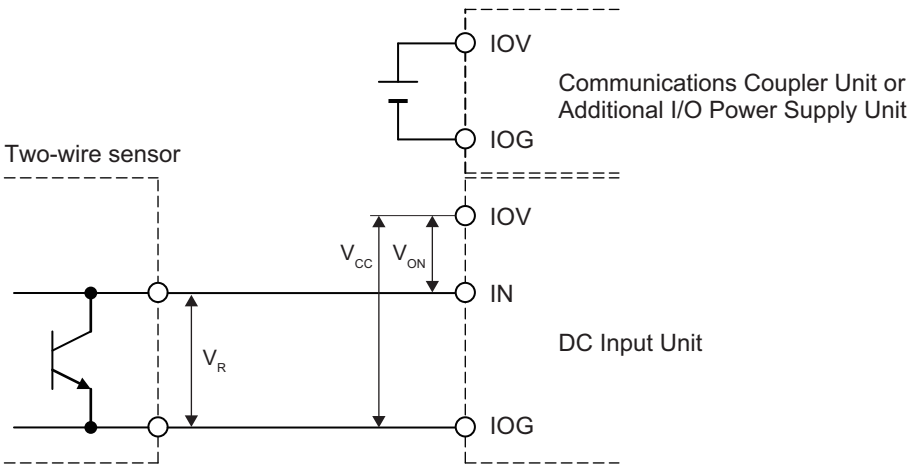
When a two-wire sensor is used with a DC Input Unit, check that the following conditions are met. Failure to meet these conditions may result in operating errors.

(a) Relation between ON voltage of the DC Input Unit and sensor residual voltage

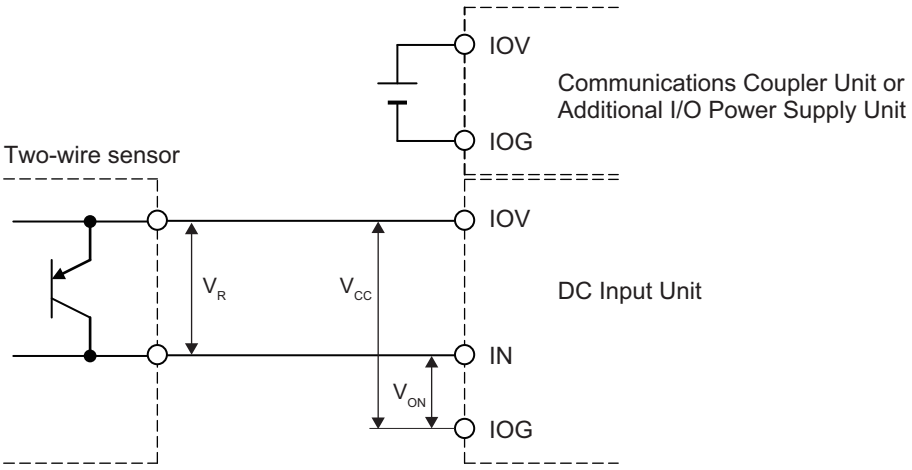
The DC Input Unit cannot detect sensor output ON unless the following conditions are satisfied:

$V_{ON} \leq V_{CC} - V_R$

The voltages related to the conditions for NPN type sensors are shown in the figure below.



The voltages related to the conditions for PNP type sensors are shown in the figure below.



V_{CC}: Power supply voltage

V_R: Sensor's output residual voltage

V_{ON}: ON voltage of DC Input Unit

(b) Relation between input current to the DC Input Unit and sensor control output (load current)

The DC Input Unit cannot detect sensor output ON unless the following conditions are satisfied:

I_{OUT} (min) ≤ I_{in} ≤ I_{OUT} (max)

I_{OUT} (min): Minimum value of load current

I_{OUT} (max): Maximum value of load current

Use the following equation to calculate the input current of the resistance input.

I_{in} = (V_{CC} - V_R - 1.5 [internal residual voltage of DC Input Unit]) / R_{IN}

Use the following equation to calculate the input current of the constant current input.

I_{in} = I_{ON}

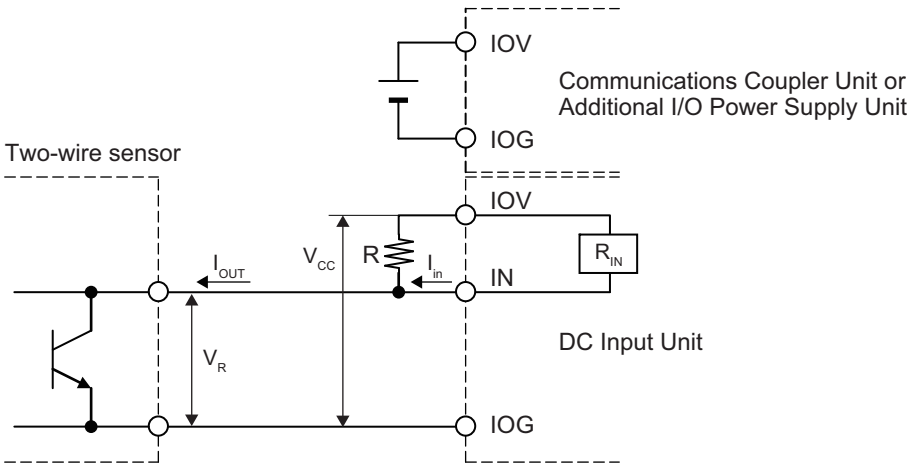
Note For constant current input type Input Units, the input current does not increase linearly for the input voltage. If you gradually raise the input voltage and once the input current reaches I_{ON}, the input current does not increase and remains roughly constant even when the input voltage is raised.

When I_{in} is smaller than I_{OUT} (min), connect a bleeder resistor R. The bleeder resistor constant can be calculated as follows: Select an appropriate bleeder resistor R so that both equations can be satisfied.

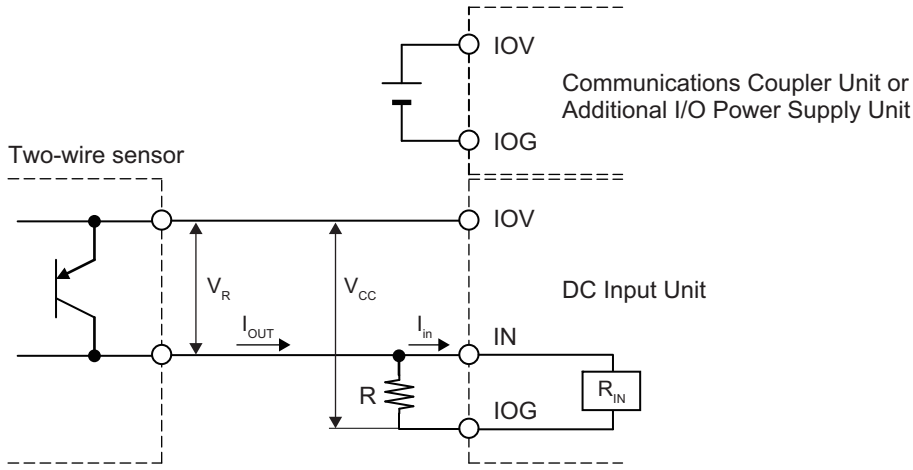
R ≤ (V_{CC} - V_R) / (I_{OUT} (min) - I_{ON})

Rated power W of bleeder resistor ≥ (V_{CC} - V_R)^2 / R × 4 [allowable margin]

The voltages and currents related to the conditions for NPN type sensors are shown in the figure below.



The voltages and currents related to the conditions for PNP type sensors are shown in the figure below.



V_{CC}: Power supply voltage

V_R: Sensor's output residual voltage

I_{OUT}: Sensor control output (load current)

I_{ON}: Input current of DC Input Unit (Input current when the rated voltage is applied)

R: Bleeder resistor

R_{IN}: Input resistor of DC Input Unit

(c) Relation between OFF current of the DC Input Unit and sensor leakage current

The DC Input Unit cannot detect sensor output OFF unless the following conditions are satisfied:

$I_{OFF} \geq I_{leak}$

When I_{leak} is greater than I_{OFF}, connect a bleeder resistor R.

Use the following equation to calculate the bleeder resistance constant of the resistance input.

$R \leq R_{IN} \times V_{OFF} / (I_{leak} \times R_{IN} - V_{OFF})$

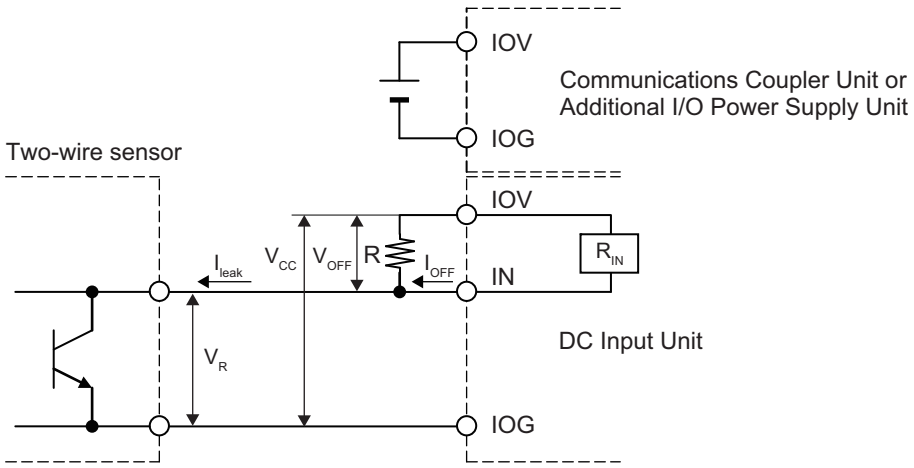
Use the following equation to calculate the bleeder resistance constant of the constant current input.

$R \leq (V_{OFF} / I_{OFF}) \times V_{OFF} / (I_{leak} \times (V_{OFF} / I_{OFF}) - V_{OFF})$

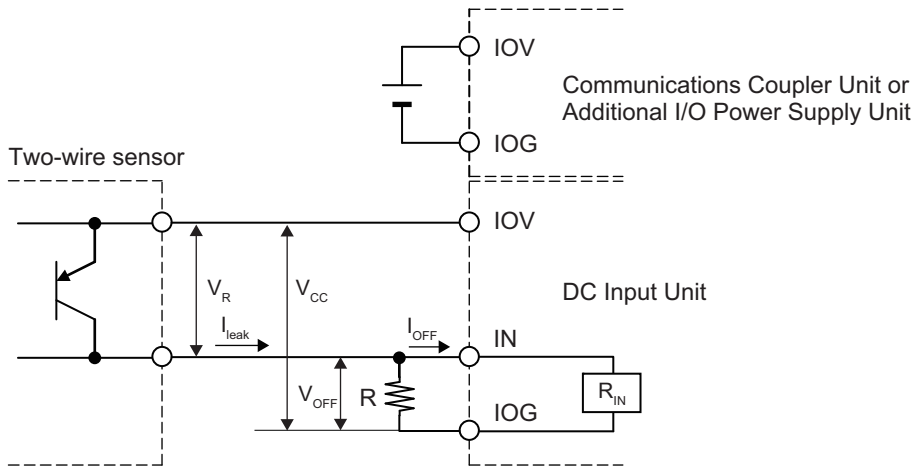
For both the resistance input and constant current input, use the following equation to calculate the rated power of bleeder resistor.

Rated power W of bleeder resistor $\geq (V_{CC} - V_R)^2 / R \times 4$ [allowable margin]

The voltages and currents related to the conditions for NPN type sensors are shown in the figure below.



The voltages and currents related to the conditions for PNP type sensors are shown in the figure below.



V_{CC}: Power supply voltage

V_R: Sensor's output residual voltage

V_{OFF}: OFF voltage of DC Input Unit

I_{leak}: Sensor leakage current

R: Bleeder resistor

I_{OFF}: OFF current of DC Input Unit

R_{IN}: Input resistor of DC Input Unit

(d) Precautions on sensor inrush current

An incorrect input may occur due to sensor inrush current if a sensor is turned ON after the DC Input Unit has started up to the point where inputs are possible.

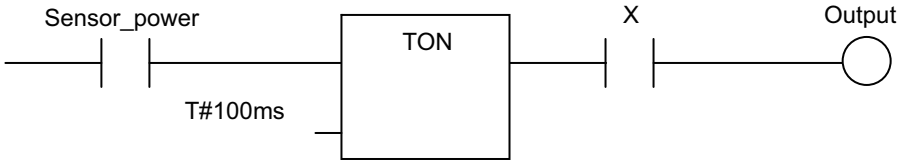
Determine the time required for sensor operation to stabilize after the sensor is turned ON and take appropriate measures, such as inserting an ON delay into the user program after turning ON the sensor.

A programming example is shown below.

The sensor's power supply voltage is used as the input bit to *Sensor_power*.

A 100-ms timer delay (the time required for an OMRON Proximity Sensor to stabilize) is created in the user program.

After the timer changes to TRUE, input bit *X* causes the output *Output* to change to TRUE after the input of the sensor changes to TRUE.



4-4-2 Precautions when Wiring to the Output Units (Screwless Clamping Terminal Block)

Output Short-circuit Protection

If a load connected to the output terminals is short-circuited, output components and printed circuit boards may be damaged. To guard against this, use the NX Units with load short-circuit protection.

When using the NX Units without load short-circuit protection, incorporate a protective fuse in the external circuit. Use a fuse with a capacity of around twice the rated output.

Inrush Current

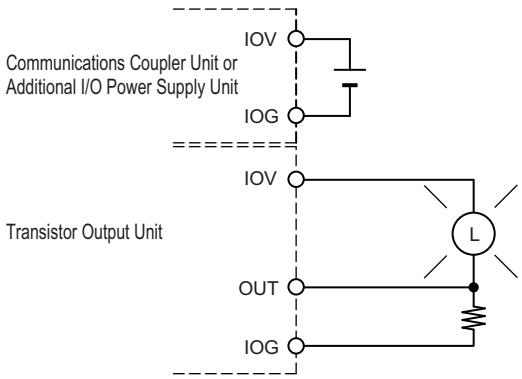
When connecting a transistor to an output device with a high inrush current (such as an incandescent lamp), steps must be taken to avoid damage to the output transistor.

Use either of the following methods to reduce the inrush current.

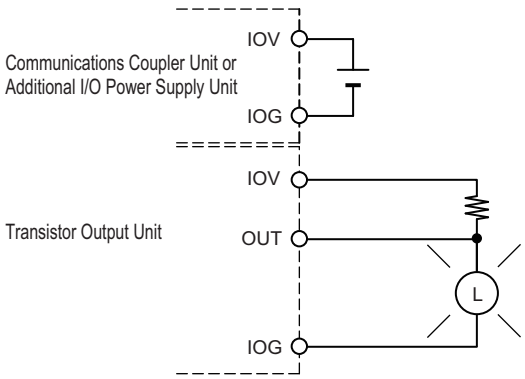
● Countermeasure 1

Draw about 1/3 of the current consumed by the load.

NPN type



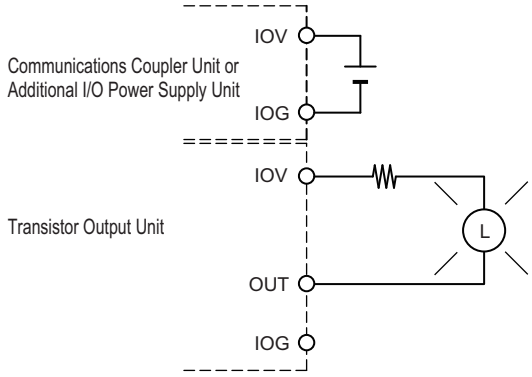
PNP type



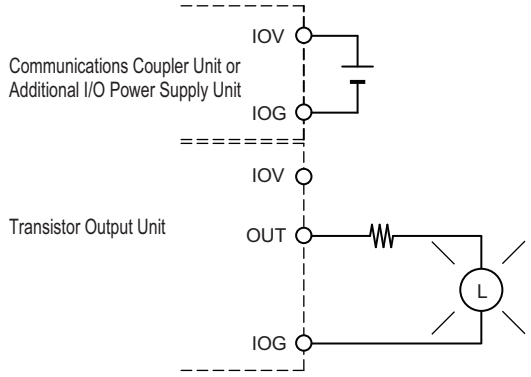
● Countermeasure 2

Mount a limiting resistor.

NPN type



PNP type



In countermeasure 1, the current consumption from I/O power supply is increased although the voltage supplied to the load L is not decreased.

In countermeasure 2, the voltage supplied to the load L is decreased although the current consumption from I/O power supply is not increased.

Select the appropriate countermeasures according to the operating conditions.

5

I/O Refreshing

This section describes the types and functions of I/O refreshing for the NX Units.

5-1 I/O Refreshing for Slave Terminals 5-2
5-1-1 I/O Refreshing from CPU Unit to Slave Terminal 5-2
5-2 I/O Refreshing Methods 5-3
5-2-1 Types of I/O Refreshing Methods 5-3
5-2-2 Setting the I/O Refreshing Methods 5-3
5-2-3 Selecting NX Units 5-4
5-2-4 Free-Run Refreshing 5-4
5-2-5 Synchronous Input Refreshing 5-8
5-2-6 Synchronous Output Refreshing 5-12

5-1 I/O Refreshing for Slave Terminals

This section describes I/O refreshing for NX-series Slave Terminals.

5-1-1 I/O Refreshing from CPU Unit to Slave Terminal

The CPU Unit cyclically performs I/O refreshing with the Slave Terminal through the Communications Master and Communications Coupler Units.

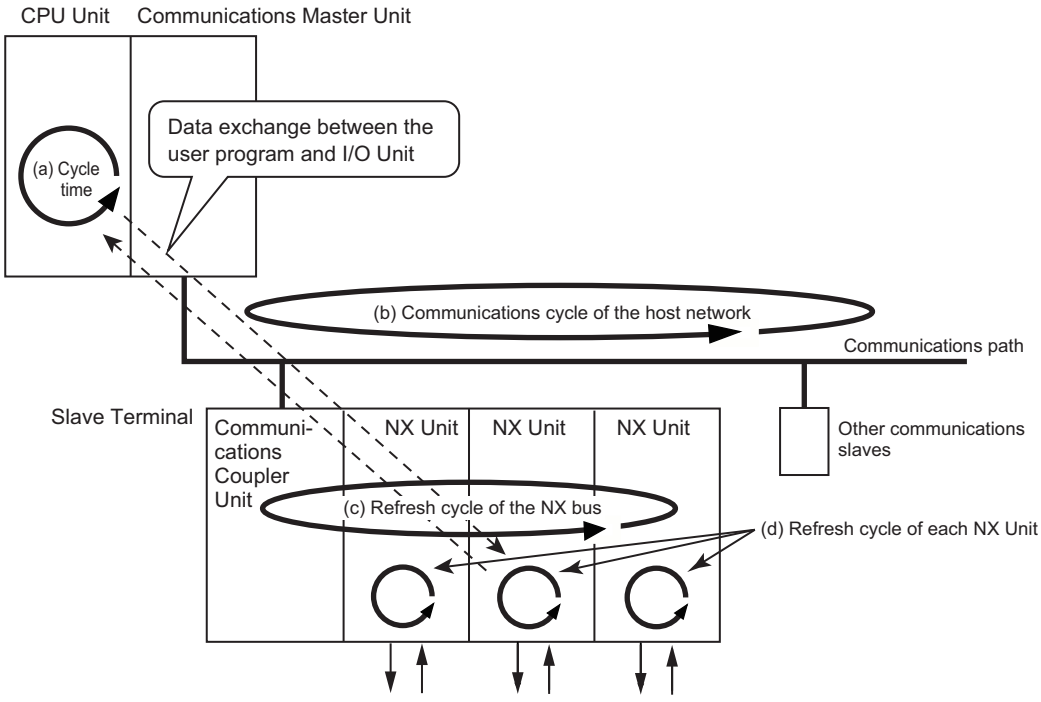
There are the following four cycles that affect I/O refresh operations between the NX Unit on a Slave Terminal and the CPU Unit.

(a) Cycle time of the CPU Unit

(b) Communications cycle of the host network

(c) Refresh cycle of the NX bus

(d) Refresh cycle of each NX Unit



The cycle time of the CPU Unit and communications cycle of the host network and the I/O refresh cycle of the NX bus are determined by the CPU Unit types and the communications types.

The following shows the operation of I/O refreshing when the built-in EtherCAT port on the NJ-series CPU Unit is used for communications with an EtherCAT Slave Terminal.

- The process data communications cycle in item (b) and the refresh cycle of the NX bus in item (c) are automatically synchronized with the primary period of the CPU Unit in item (a).
- The refresh cycle of each NX Unit in item (d) depends on the I/O refreshing method which is given below.

*1. This applies when the distributed clock is enabled in the EtherCAT Coupler Unit.

5-2 I/O Refreshing Methods

This section describes I/O refreshing methods for the NX Units.

5-2-1 Types of I/O Refreshing Methods

When an EtherCAT Coupler Unit is connected to the built-in EtherCAT port on the NJ-series CPU Unit, the I/O refreshing methods that you can use between the EtherCAT Coupler Unit and the NX Units are as follows.

I/O refreshing method name	Outline of operation
Free-Run refreshing	With this I/O refreshing method, the refresh cycle of the NX bus and the I/O refresh cycles of the NX Units are asynchronous.
Synchronous I/O refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is synchronous on a fixed interval between more than one NX Unit on more than one Slave Terminal.

Since the EtherCAT Coupler Unit can execute all I/O refreshing methods at the same time, you can use NX Units with different I/O refreshing methods together in the EtherCAT Slave Terminal.

5-2-2 Setting the I/O Refreshing Methods

The I/O refreshing method between the EtherCAT Coupler Unit and each NX Unit is determined by whether the distributed clock is enabled or disabled in the EtherCAT Coupler Unit.

Distributed clock enable/disable setting in the EtherCAT Coupler Unit	NX Units that support only Free-Run refreshing	NX Units that support both Free-Run refreshing and Synchronous I/O refreshing
Enabled (DC Mode)	Free-Run refreshing	Synchronous I/O refreshing
Disabled (Free-Run Mode)	Free-Run refreshing	Free-Run refreshing

Additional Information

The EtherCAT Slave Terminals with enabled distributed clocks and all EtherCAT slaves that support DC synchronization execute I/O processing based on Sync0 that is shared on the EtherCAT network. However, since the specifications and performance for the timing to read inputs or to refresh outputs for EtherCAT slaves and NX Units are different, the timing to read inputs or to refresh outputs is not simultaneous.
Refer to the manuals for the EtherCAT slaves for information on the timing to read inputs or to refresh outputs in EtherCAT slaves.

5-2-3 Selecting NX Units

The I/O refreshing methods that you can use depend on the model of the NX Unit. After you decide on which I/O refreshing method to use, select the NX Units.

5-2-4 Free-Run Refreshing

With this I/O refreshing method, the refresh cycle of the NX bus and I/O refresh cycles of the NX Units are asynchronous.

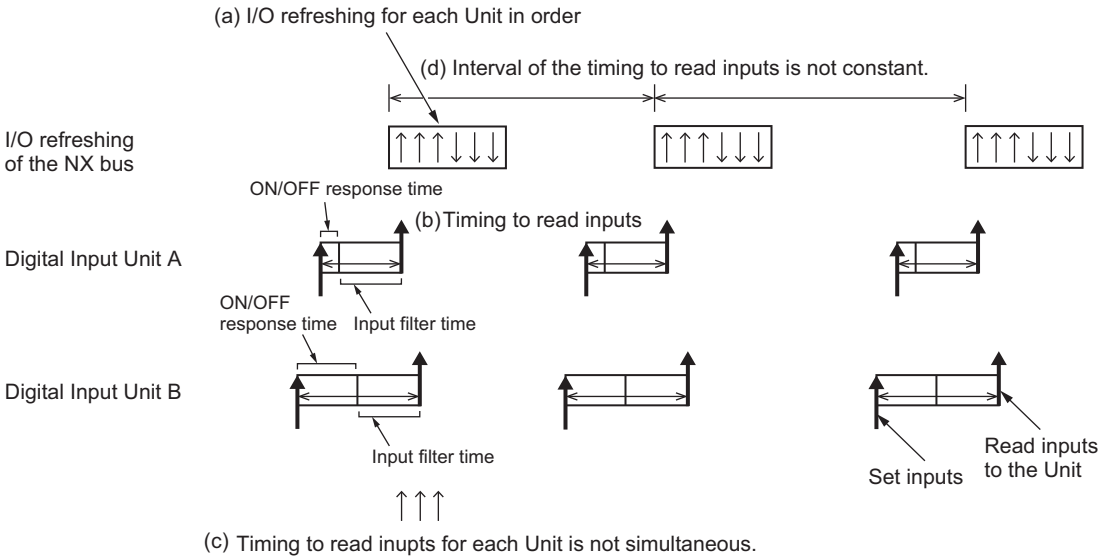
Digital I/O Units read inputs or refresh outputs at the time of I/O refreshing.

This method is used when it is not necessary to be aware of factors such as the I/O timing jitter and the concurrency of the timing to read inputs and refresh outuputs between the NX Units.

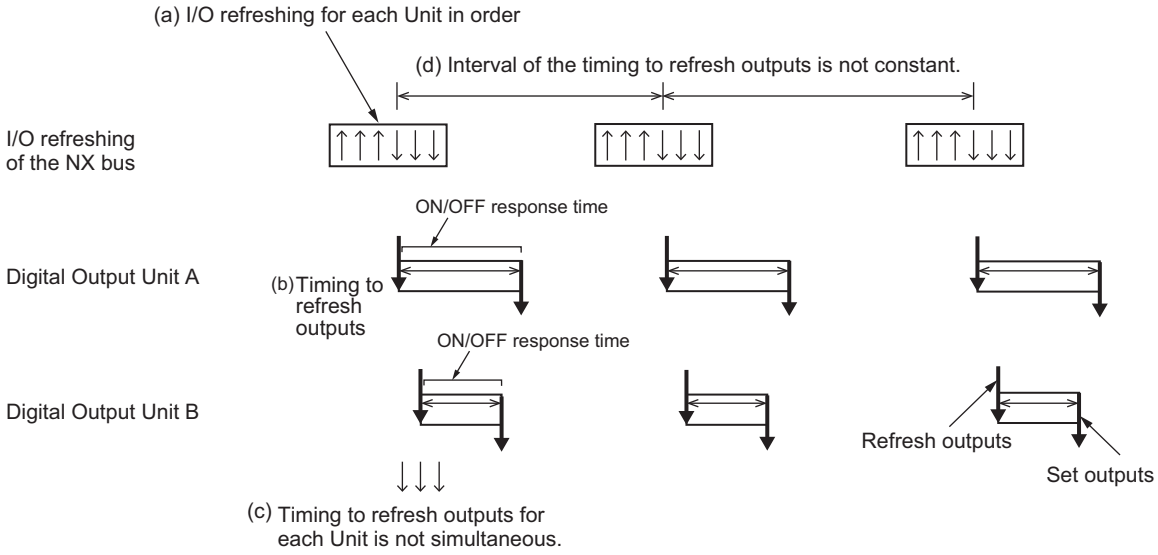
Description of Operation

- You can connect the following NX Units to the Slave Terminal to use this method.
  The NX Units that support Free-Run refreshing
- The Communications Coupler Unit performs I/O refreshing for NX Units in order. (Refer to (a) in the figure below.)
- The NX Units read inputs or refresh outputs at the time of I/O refreshing. (Refer to (b) in the figure below.)
- The Communications Coupler Unit can read the most recent input value at the time of I/O refreshing and the NX Units can control the most recent output value at the time of I/O refreshing. However, since I/O refreshing is performed in order, timing to read inputs or to refresh outputs for each NX Unit in the Slave Terminal does not occur at the same time. (Refer to (c) in the figure below.)
- The interval of I/O refreshing varies with the processing conditions of the Communications Coupler Unit or the host communications master. Therefore, the nterval of the ttiming to read inputs or to refresh outputs for NX Unit is not always the same. (Refer to (d) in the figure below.)
- In order to read input values correctly, you must set the inputs before the total of the ON/OFF response time and the input filter time from the timing to read inputs for each NX Unit.
- The ON/OFF response time is needed from the timing to refresh outputs until setting the output status of external terminals on the NX Units.

● Inputs


(a) I/O refreshing for each Unit in order
(d) Interval of the timing to read inputs is not constant.
I/O refreshing of the NX bus
ON/OFF response time
(b) Timing to read inputs
Digital Input Unit A
ON/OFF response time
Input filter time
Digital Input Unit B
Input filter time
Read inputs to the Unit
Set inputs
(c) Timing to read inupts for each Unit is not simultaneous.

● Outputs


(a) I/O refreshing for each Unit in order
(d) Interval of the timing to refresh outputs is not constant.
I/O refreshing of the NX bus
ON/OFF response time
Digital Output Unit A
(b) Timing to refresh outputs
ON/OFF response time
Digital Output Unit B
Refresh outputs
Set outputs
(c) Timing to refresh outputs for each Unit is not simultaneous.

Settings

Enable the distributed clock in the EtherCAT slave parameters on the EtherCAT Coupler Unit that is added to the EtherCAT network configuration and add the NX Units that support Free-Run refreshing to the NX Unit configuration.

Or disable the distributed clock in the EtherCAT slave parameters and add NX Units that support either Free-Run refreshing or Synchronous I/O refreshing to the NX Unit configuration.

I/O Port

Digital Input Units

This uses the I/O ports of the input values.

Four-point Input Units

I/O port name	Type	R/W	Name	Description	Default value
Input Bit 00	BOOL	RO	Input Bit 00	The input value for input bit 00.	FALSE
Input Bit 01	BOOL	RO	Input Bit 01	The input value for input bit 01.	FALSE
Input Bit 02	BOOL	RO	Input Bit 02	The input value for input bit 02.	FALSE
Input Bit 03	BOOL	RO	Input Bit 03	The input value for input bit 03.	FALSE

Eight-point Input Units

I/O port name	Type	R/W	Name	Description	Default value
Input Bit (8 bits)	BYTE	RO	Input Bit (8 bits)	The input values for 8 bits.	00 hex

Sixteen-point Input Units

I/O port name	Type	R/W	Name	Description	Default value
Input Bit (16 bits)	WORD	RO	Input Bit (16 bits)	The input values for 16 bits.	0000 hex

Digital Output Units

This uses the I/O ports of the output set values.

Two-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 00	BOOL	RW	Output Bit 00	The output set value for output bit 00.	FALSE
Output Bit 01	BOOL	RW	Output Bit 01	The output set value for output bit 01.	FALSE

Four-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 00	BOOL	RW	Output Bit 00	The output set value for output bit 00.	FALSE
Output Bit 01	BOOL	RW	Output Bit 01	The output set value for output bit 01.	FALSE
Output Bit 02	BOOL	RW	Output Bit 02	The output set value for output bit 02.	FALSE
Output Bit 03	BOOL	RW	Output Bit 03	The output set value for output bit 03.	FALSE

Eight-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit (8 bits)	BYTE	RW	Output Bit (8 bits)	The output set values for 8 bits.	00 hex

Sixteen-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit (16 bits)	WORD	RW	Output Bit (16 bits)	The output set values for 16 bits.	0000 hex

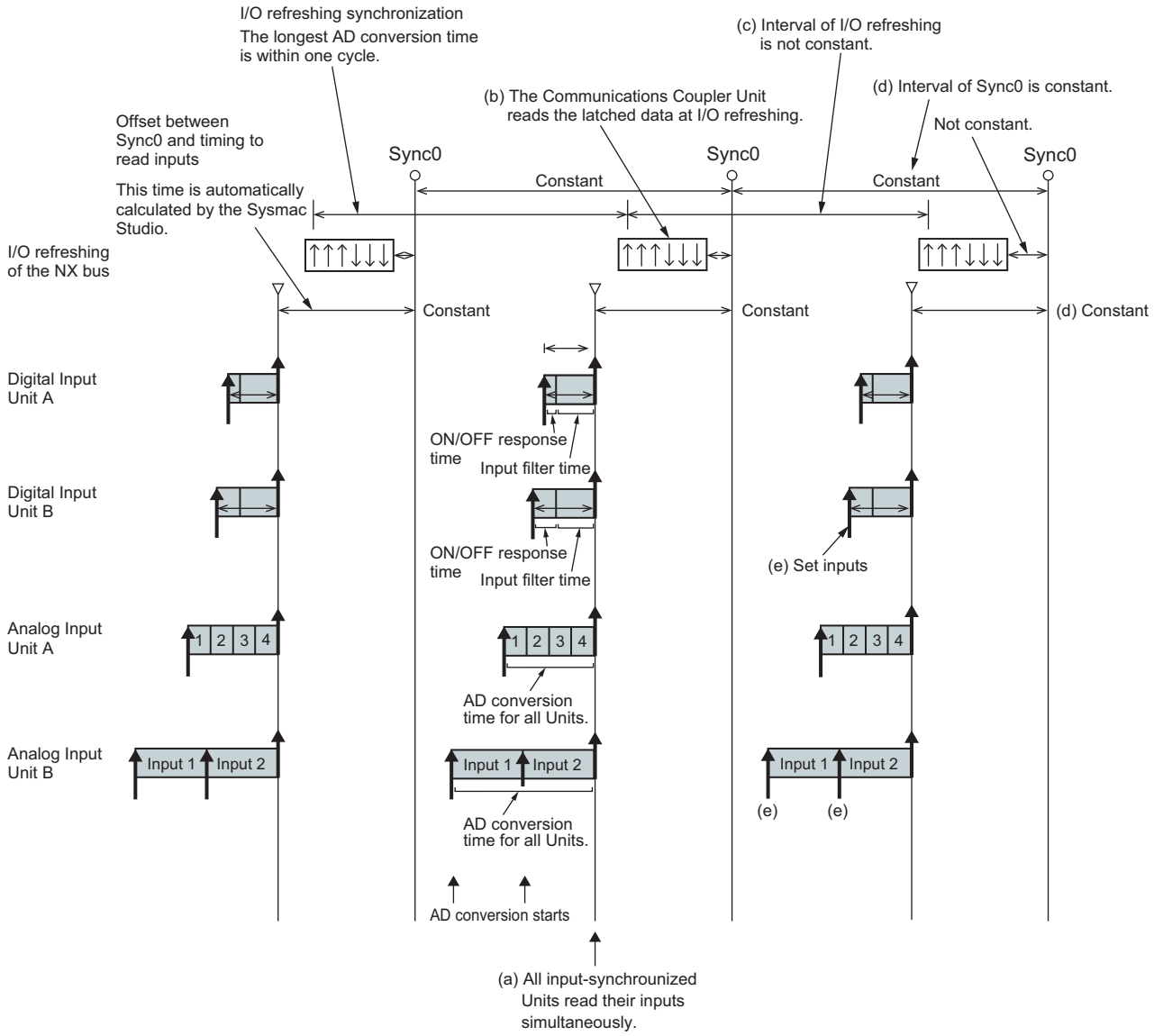
5-2-5 Synchronous Input Refreshing

With this I/O refreshing mehtod, the timing to read inputs is synchronized on a fixed interval between more than one NX Unit on the Slave Terminal.

This method is used when the problem such as input timing jitter or offset of timing to read inputs between more than one NX Unit happens.

Description of Operation

- This method is used when you connect the NX Units that support Synchronous I/O refreshing to the EtherCAT Coupler Unit that is connected to the built-in EtherCAT port on the NJ-series CPU Unit.
- All Digital Input Units and Analog Input Units that operate with Synchronous input refreshing in the Slave Terminal read their inputs at the same time at a fixed interval bases on Sync0. (Refer to (a) in the figure below.)
- The Communications Coupler Unit read the input values that are latched at the time to read inputs at immediate I/O refreshing. (Refer to (b) in the figure below.)
- The interval of I/O refreshing varies with the processing conditions of the Communications Coupler Unit or the host communications master. (Refer to (c) in the figure below.) The timing to read inputs will be at a fixed interval. (Refer to (d) in the figure below.)
- The Sync0, the timing to read inputs and the maximum NX bus I/O refresh cycle of the Slave Terminals are automatically calculated by the Sysmac Studio according to the input refresh cycle of the NX Units in the Slave Terminals when the Slave Terminals are configured and set up.
- In order to read input values correctly, you must determine the inputs before the total of the ON/OFF response time and input filter time from the timing to read inputs for each NX Unit. (Refer to (e) in the figure below.)


I/O refreshing synchronization
The longest AD conversion time is within one cycle.
(c) Interval of I/O refreshing is not constant.
(b) The Communications Coupler Unit reads the latched data at I/O refreshing.
(d) Interval of Sync0 is constant.
Not constant.
Offset between Sync0 and timing to read inputs
This time is automatically calculated by the Sysmac Studio.
Sync0
Sync0
Sync0
Constant
Constant
I/O refreshing of the NX bus
Constant
Constant
(d) Constant
Digital Input Unit A
ON/OFF response time
Input filter time
Digital Input Unit B
ON/OFF response time
Input filter time
(e) Set inputs
Analog Input Unit A
1 2 3 4
1 2 3 4
1 2 3 4
AD conversion time for all Units.
Analog Input Unit B
Input 1
Input 2
Input 1
Input 2
Input 1
Input 2
AD conversion time for all Units.
(e)
(e)
AD conversion starts
(a) All input-synchrounized Units read their inputs simultaneously.

Settings

Set the following items.

● Adding to the NX Unit Configuration

Enable the distributed clock in the EtherCAT slave parameters on the EtherCAT Coupler Unit that is added to the EtherCAT network configuration and add the NX Units that support Synchronous I/O refreshing to the NX Unit configuration.

● Setting the Task Period

Set the task period of the primary periodic task.

With the primary periodic task in Configurations and Setup - Task Settings, select the task period in the Period/Execution Conditions from the list.

At this time, set the primary period to a task period in which the value that is greater than the I/O refresh cycle of the NX bus that is calculated by the Sysmac Studio.

A warning is given if you set the primary period to a task period in which the value that is smaller than the I/O refresh cycle of the NX bus that is calculated by the Sysmac Studio.

Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519) for a warning on the task periods.

I/O Port

This uses the I/O ports of the input values.

● Four-point Input Units

I/O port name	Type	R/W	Name	Description	Default value
Input Bit 00	BOOL	RO	Input Bit 00	The input value for input bit 00.	FALSE
Input Bit 01	BOOL	RO	Input Bit 01	The input value for input bit 01.	FALSE
Input Bit 02	BOOL	RO	Input Bit 02	The input value for input bit 02.	FALSE
Input Bit 03	BOOL	RO	Input Bit 03	The input value for input bit 03.	FALSE

● Eight-point Input Units

I/O port name	Type	R/W	Name	Description	Default value
Input Bits (8 Bits)	BYTE	RO	Input Bits (8 Bits)	The input values for 8 bits.	00 hex

● Sixteen-point Input Units

I/O port name	Type	R/W	Name	Description	Default value
Input Bits (16 Bits)	WORD	RO	Input Bits (16 Bits)	The input values for 16 bits.	0000 hex

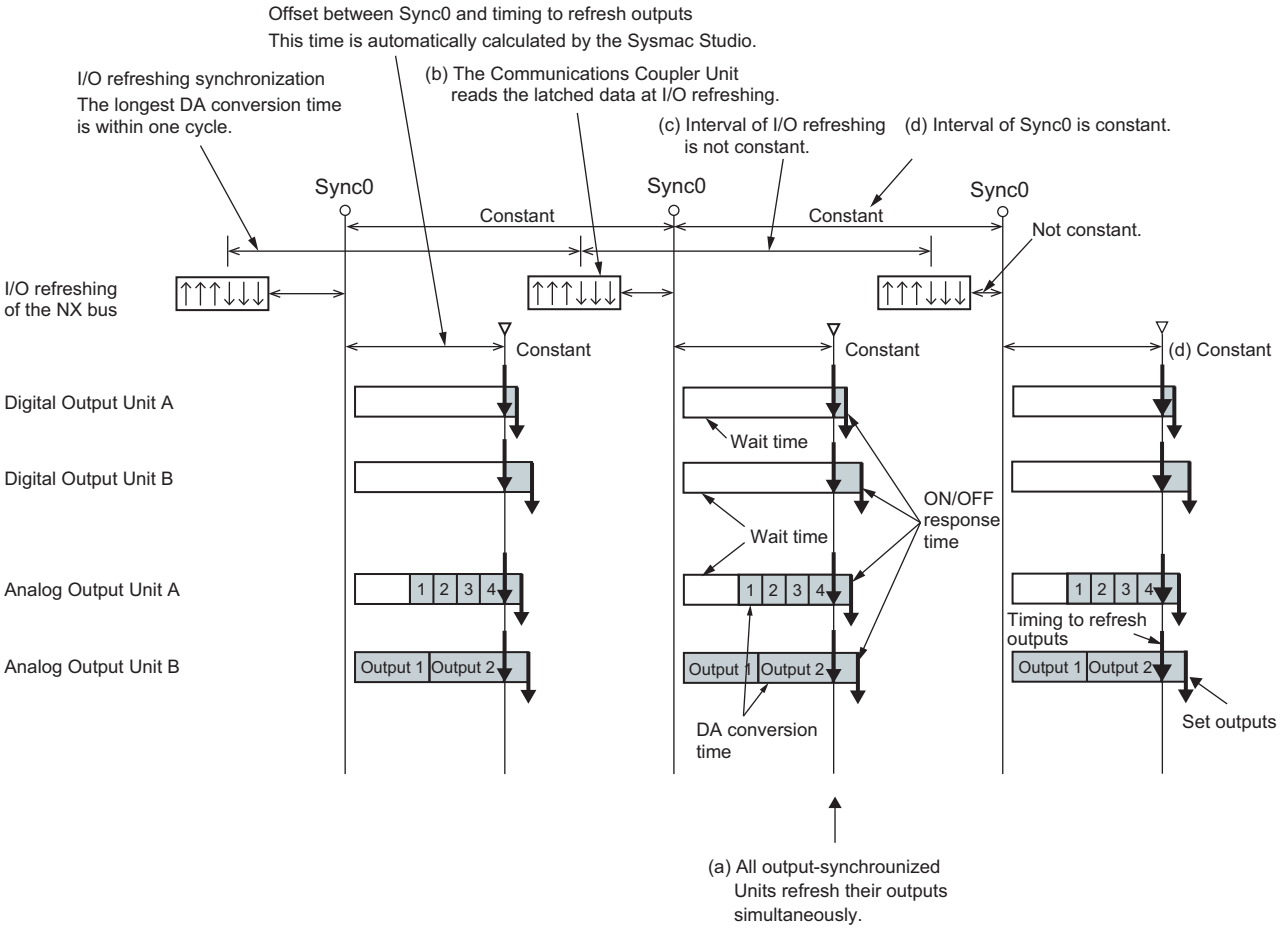
5-2-6 Synchronous Output Refreshing

With this I/O refreshing mehtod, the timing to refresh outputs is synchronized on a fixed interval between more than one NX Unit on the Slave Terminal.

This method is used when the problem such as input timing jitter or offset of timing to refresh outputs between more than one NX Unit happens.

Description of Operation

- This method is used when you connect the NX Units that support Synchronous I/O refreshing to the EtherCAT Coupler Unit, that is connected to the built-in EtherCAT port on the NJ-series CPU Unit.
- All Digital Output Units and Analog Output Units that operate with Synchronous output refreshing in the Slave Terminal refresh their outputs at the same time at a fixed interval based on Sync0. (Refer to (a) in the figure below.)
- The Communications Coupler Unit read the output values that are latched at the time to refresh outputs at immediate I/O refreshing. (Refer to (b) in the figure below.)
- The interval of I/O refreshing varies with the processing conditions of the Communications Coupler Unit or the host communications master. (Refer to (c) in the figure below.) The timing to refresh outputs will be at a fixed interval. (Refer to (d) in the figure below.)
- The Sync0, the timing to refresh outputs and the maximum NX bus I/O refresh cycle of the Slave Terminals are automatically calculated by the Sysmac Studio according to the output refresh cycle of the NX Units in the Slave Terminals when the Slave Terminals are configured and set up.
- The ON/OFF response time is needed from the timing to refresh outputs until setting the output status of external terminals on the NX Units. (Refer to (e) in the figure below.)


Offset between Sync0 and timing to refresh outputs
This time is automatically calculated by the Sysmac Studio.
I/O refreshing synchronization
The longest DA conversion time
is within one cycle.
(b) The Communications Coupler Unit
reads the latched data at I/O refreshing.
(c) Interval of I/O refreshing
is not constant.
(d) Interval of Sync0 is constant.
Sync0
Sync0
Sync0
Constant
Constant
Not constant.
I/O refreshing
of the NX bus
Constant
Constant
(d) Constant
Digital Output Unit A
Digital Output Unit B
Analog Output Unit A
Analog Output Unit B
Wait time
Wait time
ON/OFF
response
time
1 2 3 4
Output 1 Output 2
Timing to refresh
outputs
DA conversion
time
Set outputs
(a) All output-synchrounized
Units refresh their outputs
simultaneously.

Settings

Set the following items.

Addition to NX Unit Configuration

Enable the distributed clock in the EtherCAT slave parameters on the EtherCAT Coupler Unit that is added to the EtherCAT network configuration and add the NX Units that support Synchronous I/O refreshing to the NX Unit configuration.

Setting the Task Period

Set the task period of the primary periodic task.

With the primary periodic task in Configurations and Setup - Task Settings, select the task period in the Period/Execution Conditions from the list.

At this time, set the primary period to a task period in which the value that is greater than the I/O refresh cycle of the NX bus that is calculated by the Sysmac Studio.

A warning is given if you set the primary period to a task period in which the value that is smaller than the I/O refresh cycle of the NX bus that is calculated by the Sysmac Studio.

Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519) for a warning on the task periods.

I/O Port

This uses the I/O ports of the output set values.

● Two-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 00	BOOL	RW	Output Bit 00	The output set value for output bit 00.	FALSE
Output Bit 01	BOOL	RW	Output Bit 01	The output set value for output bit 01.	FALSE

● Four-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bit 00	BOOL	RW	Output Bit 00	The output set value for output bit 00.	FALSE
Output Bit 01	BOOL	RW	Output Bit 01	The output set value for output bit 01.	FALSE
Output Bit 02	BOOL	RW	Output Bit 02	The output set value for output bit 02.	FALSE
Output Bit 03	BOOL	RW	Output Bit 03	The output set value for output bit 03.	FALSE

● Eight-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bits (8 Bits)	BYTE	RW	Output Bits (8 Bits)	The output set values for 8 bits.	00 hex

● Sixteen-point Output Units

I/O port name	Type	R/W	Name	Description	Default value
Output Bits (16 Bits)	WORD	RW	Output Bits (16 Bits)	The output set values for 16 bits.	0000 hex

6

Digital Input Units

This section describes the types and functions of Digital Input Units.

6-1 Types of Digital Input Units 6-2

6-2 Specifications of I/O Data 6-3

6-2-1 Allocable I/O Data 6-3

6-3 List of Settings 6-6

6-4 Function 6-10

6-4-1 List of Digital Input Unit Functions 6-10

6-4-2 Input Filter 6-11

6-1 Types of Digital Input Units

Digital Input Units are parts of NX Units, and process inputs of digital signals (ON/OFF signals).
The Digital Input Unit types are described below.

DC Input Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Internal I/O common	Rated input voltage	I/O refreshing method	ON/OFF response time	Reference
NX-ID3317	4 points	NPN	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 µs max./400 µs max.	P. A-5
NX-ID3343			24 VDC		100 ns max./100 ns max.	P. A-6
NX-ID3417		PNP	12 to 24 VDC		20 µs max./400 µs max.	P. A-7
NX-ID3443			24 VDC		100 ns max./100 ns max.	P. A-8
NX-ID4342	8 points	NPN			20 µs max./400 µs max.	P. A-9
NX-ID4442		PNP				P. A-10
NX-ID5342	16 points	NPN				P. A-11
NX-ID5442		PNP				P. A-12

6-2 Specifications of I/O Data

This section describes I/O data for the Digital Input Units.

6-2-1 Allocable I/O Data

This section describes the allocable I/O data in the Digital Input Unit.

An I/O entry mapping is assigned to the I/O allocation settings for the Digital Input Unit.

A specific I/O entry is assigned to the I/O entry mapping for each NX Unit model. These allocations are fixed, so you cannot add others or change them.

An I/O entry means the I/O data described in this section. An I/O entry mapping means a collection of I/O entries.

To assign the I/O allocation information of the EtherCAT Slave Terminal to an NJ-series CPU Unit, use the I/O ports for the allocated I/O data.

To access I/O data with the Read NX Unit Object instruction or the Write NX Unit Object instruction, use the index numbers.

NX Units in Free-Run Refreshing or Synchronous I/O Refreshing

● Four-point Input Units

Data name	Description	Data type	Default value	I/O port name	Index	Subin-dex
Input Bit 00	The input value for input bit 00.	BOOL	FALSE	Input Bit 00	6000 hex	01 hex
Input Bit 01	The input value for input bit 01.	BOOL	FALSE	Input Bit 01		02 hex
Input Bit 02	The input value for input bit 02.	BOOL	FALSE	Input Bit 02		03 hex
Input Bit 03	The input value for input bit 03.	BOOL	FALSE	Input Bit 03		04 hex

Eight-point Input Units

Data name	Description	Data type	Default value	I/O port name	Index	Subin-dex
Input Bit (8 bits)	The input values for 8 bits. The following 8 BOOL data are included.	BYTE	00 hex	Input Bit (8 bits)	6001 hex	01 hex
Input Bit 00	The input value for input bit 00.	BOOL	FALSE	Input Bit 00		
Input Bit 01	The input value for input bit 01.	BOOL	FALSE	Input Bit 01		
Input Bit 02	The input value for input bit 02.	BOOL	FALSE	Input Bit 02		
Input Bit 03	The input value for input bit 03.	BOOL	FALSE	Input Bit 03		
Input Bit 04	The input value for input bit 04.	BOOL	FALSE	Input Bit 04		
Input Bit 05	The input value for input bit 05.	BOOL	FALSE	Input Bit 05		
Input Bit 06	The input value for input bit 06.	BOOL	FALSE	Input Bit 06		
Input Bit 07	The input value for input bit 07.	BOOL	FALSE	Input Bit 07		

Sixteen-point Input Units

Data name	Description	Data type	Default value	I/O port name	Index	Subin-dex
Input Bit (16 bits)	The input values for 16 bits. The following 16 BOOL data are included.	WORD	0000 hex	Input Bit (16 bits)	6002 hex	01 hex
Input Bit 00	The input value for input bit 00.	BOOL	FALSE	Input Bit 00		
Input Bit 01	The input value for input bit 01.	BOOL	FALSE	Input Bit 01		
Input Bit 02	The input value for input bit 02.	BOOL	FALSE	Input Bit 02		
Input Bit 03	The input value for input bit 03.	BOOL	FALSE	Input Bit 03		
Input Bit 04	The input value for input bit 04.	BOOL	FALSE	Input Bit 04		
Input Bit 05	The input value for input bit 05.	BOOL	FALSE	Input Bit 05		
Input Bit 06	The input value for input bit 06.	BOOL	FALSE	Input Bit 06		
Input Bit 07	The input value for input bit 07.	BOOL	FALSE	Input Bit 07		
Input Bit 08	The input value for input bit 08.	BOOL	FALSE	Input Bit 08		
Input Bit 09	The input value for input bit 09.	BOOL	FALSE	Input Bit 09		
Input Bit 10	The input value for input bit 10.	BOOL	FALSE	Input Bit 10		
Input Bit 11	The input value for input bit 11.	BOOL	FALSE	Input Bit 11		
Input Bit 12	The input value for input bit 12.	BOOL	FALSE	Input Bit 12		
Input Bit 13	The input value for input bit 13.	BOOL	FALSE	Input Bit 13		
Input Bit 14	The input value for input bit 14.	BOOL	FALSE	Input Bit 14		
Input Bit 15	The input value for input bit 15.	BOOL	FALSE	Input Bit 15		

6-3 List of Settings

The followings are the setting descriptions, setting ranges, and default values of the functions that can be used in the Digital Input Units.

The settings are reflected after the Unit is restarted.

Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Sysmac Studio is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

● Four-point Input Units

NX-ID3317/ID3417

Setting name	Description	Default value	Setting range	Unit	Index	Subin-dex	Refer-ence
Input Filter Value Setting	Set the filter time of input signal. *1	*1	*1	–	5000 hex	01 hex	P. 6-11
Input Filter Mode Setting	Set the operating mode for the filter. *2	*2	*2	–		02 hex	

*1. The descriptions of Input Filter Value Setting are as follows.

Set value	Setting description	Default value	Setting range
0	No Filter	3	0 to 11
1	0.25 ms		
2	0.5 ms		
3	1 ms		
4	2 ms		
5	4 ms		
6	8 ms		
7	16 ms		
8	32 ms		
9	64 ms		
10	128 ms		
11	256 ms		

*2. The descriptions of Input Filter Mode Setting are as follows.

Set value	Setting description	Default value	Setting range
0	Enable ON Filter and OFF Filter	0	0/1
1	Enable Only OFF Filter		

NX-ID3343/ID3443

Setting name	Description	Default value	Setting range	Unit	Index	Subin-dex	Refer-ence
Input Filter Value Setting	Set the filter time of input signal. *1	*1	*1	-	5001 hex	01 hex	P. 6-11
Input Filter Mode Setting	Set the operating mode for the filter. *2	*2	*2			02 hex	

*1. The descriptions of Input Filter Value Setting are as follows.

Set value	Setting description	Default value	Setting range
0	No Filter	4	0 to 9
1	1 µs		
2	2 µs		
3	4 µs		
4	8 µs		
5	16 µs		
6	32 µs		
7	64 µs		
8	128 µs		
9	256 µs		

*2. The descriptions of Input Filter Mode Setting are as follows.

Set value	Setting description	Default value	Setting range
0	Enable ON Filter and OFF Filter	0	0/1
1	Enable Only OFF Filter		

● Eight-point Input Units

Setting name	Description	Default value	Setting range	Unit	Index	Subin-dex	Refer-ence
Input Filter Value Setting	Set the filter time of input signal. *1	*1	*1	–	5000 hex	01 hex	P. 6-11
Input Filter Mode Setting	Set the operating mode for the filter. *2	*2	*2	–		02 hex	

*1. The descriptions of Input Filter Value Setting are as follows.

Set value	Setting description	Default value	Setting range
0	No Filter	3	0 to 11
1	0.25 ms		
2	0.5 ms		
3	1 ms		
4	2 ms		
5	4 ms		
6	8 ms		
7	16 ms		
8	32 ms		
9	64 ms		
10	128 ms		
11	256 ms		

*2. The descriptions of Input Filter Mode Setting are as follows.

Set value	Setting description	Default value	Setting range
0	Enable ON Filter and OFF Filter	0	0/1
1	Enable Only OFF Filter		

● Sixteen-point Input Units

Setting name	Description	Default value	Setting range	Unit	Index	Subin-dex	Refer-ence
Input Filter Value Setting	Set the filter time of input signal. *1	*1	*1	–	5000 hex	01 hex	P. 6-11
Input Filter Mode Setting	Set the operating mode for the filter. *2	*2	*2	–		02 hex	P. 6-11

*1. The descriptions of Input Filter Value Setting are as follows.

Set value	Setting description	Default value	Setting range
0	No Filter	3	0 to 11
1	0.25 ms		
2	0.5 ms		
3	1 ms		
4	2 ms		
5	4 ms		
6	8 ms		
7	16 ms		
8	32 ms		
9	64 ms		
10	128 ms		
11	256 ms		

*2. The descriptions of Input Filter Mode Setting are as follows.

Set value	Setting description	Default value	Setting range
0	Enable ON Filter and OFF Filter	0	0/1
1	Enable Only OFF Filter		

6-4 Function

This section describes the Digital Input Unit functions.

Refer to the specifications of each model in *A-1 Data Sheet* on page A-2 for details on the functions.

6-4-1 List of Digital Input Unit Functions

Function name	Description	Reference
Free-Run Refreshing	With this I/O refreshing method, the refresh cycle of the NX bus and the I/O refresh cycles of the NX Units are asynchronous.	*5-2-4 Free-Run Refreshing* on page 5-4
Synchronous I/O Refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is synchronous on a fixed interval between more than one NX Unit on more than one Slave Terminal.	*5-2-5 Synchronous Input Refreshing* on page 5-8
Input Filter	This function eliminates the chattering or the noises from input signals. It is used to prevent the error reading due to the noises. You can set the filter time constant.	*6-4-2 Input Filter* on page 6-11

6-4-2 Input Filter

Purpose

This function prevents data changes and unstable data caused by changes of input data and unstable status of input bits due to chattering and noise.

You can also use this function to make the settings to easily read the pulses that ON time is short.

Details on the Function

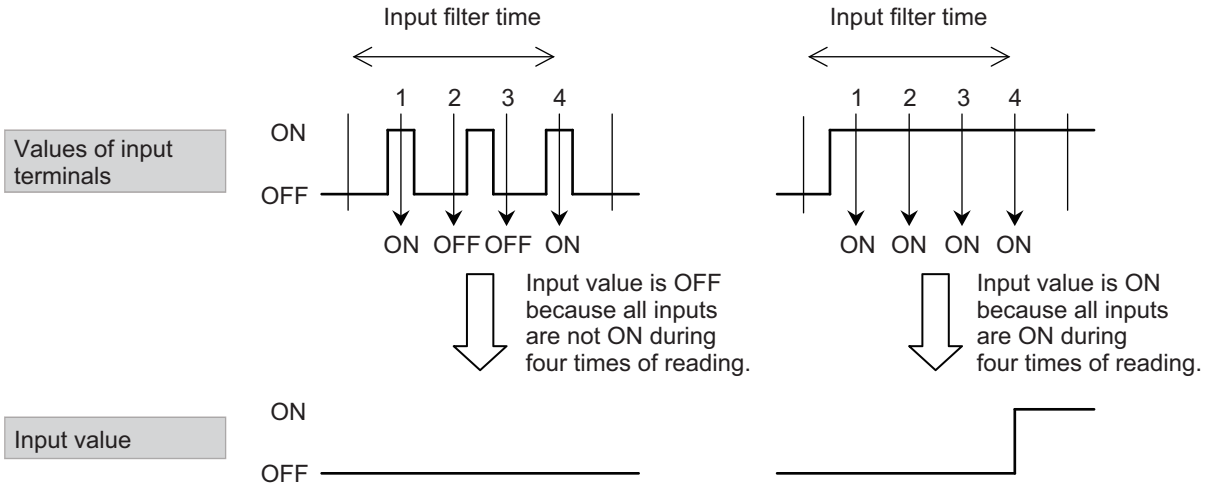
- **If Input Filter Mode Setting is Enable ON Filter and OFF Filter**

  Read the inputs at a 1/4 interval of the input filter time. When all inputs are ON or OFF, the input values turn ON or OFF.

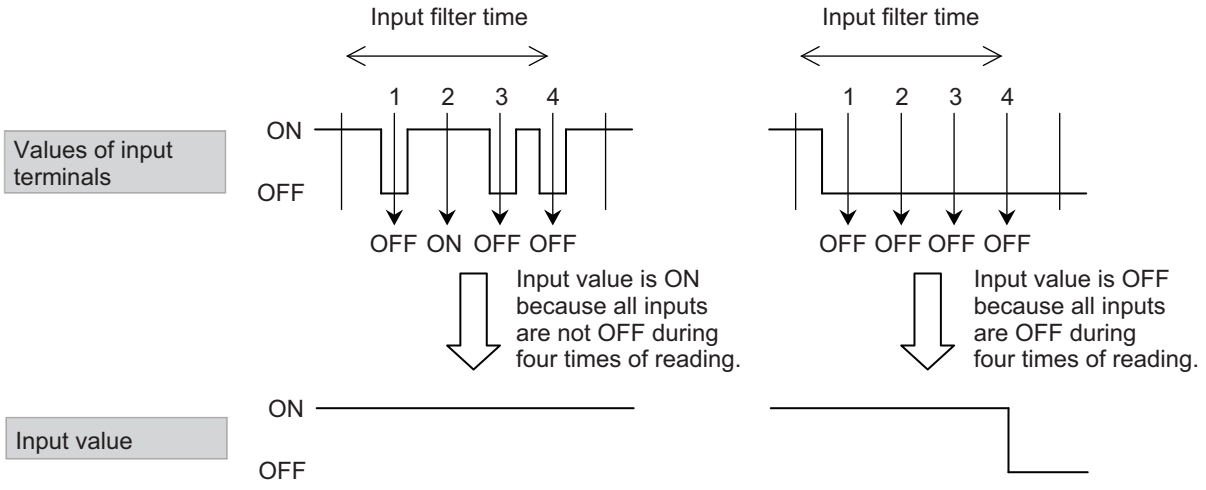
  This prevents data changes and unstable data.

  This function works for all inputs of the NX Units at the same time.

  Operation when the input turns from OFF to ON (ON filter)


Input filter time
Input filter time
1 2 3 4
1 2 3 4
Values of input terminals
ON
OFF
ON OFF OFF ON
ON ON ON ON
Input value is OFF because all inputs are not ON during four times of reading.
Input value is ON because all inputs are ON during four times of reading.
Input value
ON
OFF

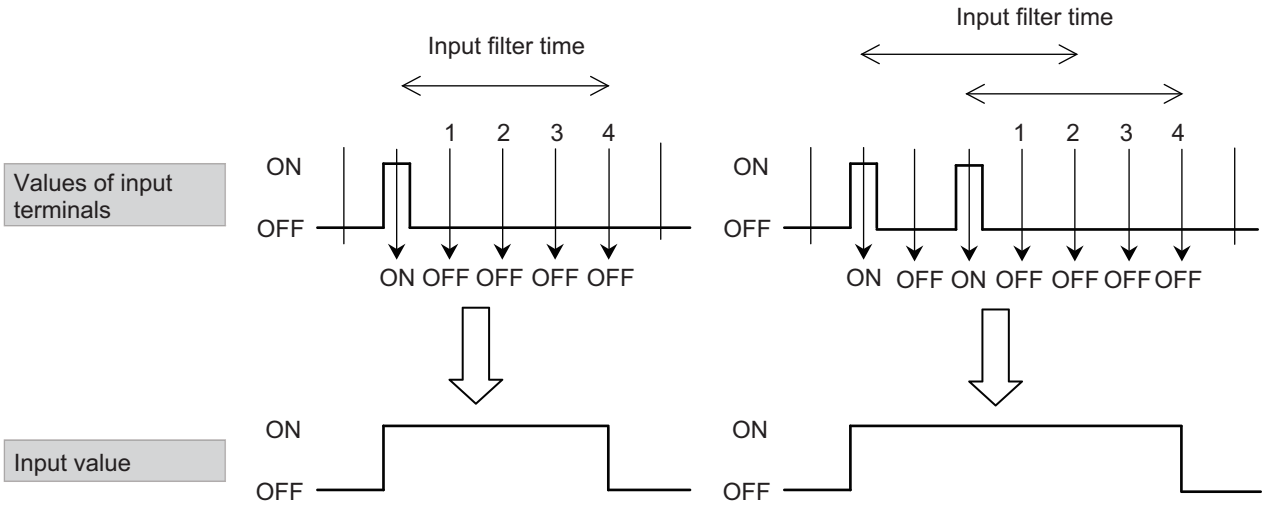
Operation when the input turns from ON to OFF (OFF filter)


Input filter time
Input filter time
1 2 3 4
1 2 3 4
Values of input terminals
ON
OFF
OFF ON OFF OFF
OFF OFF OFF OFF
Input value is ON because all inputs are not OFF during four times of reading.
Input value is OFF because all inputs are OFF during four times of reading.
ON
Input value
OFF

● If Input Filter Mode Setting is Enable Only OFF Filter

ON filter is disabled and OFF filter is enabled.

This makes easily to read the pulses that ON time is short.



When input is ON (ON filter disabled)
If the status of input terminals turns ON, the input value will turn ON immediately.

When input is OFF (OFF filter enabled)
If the status of input terminals does not turn ON again during the input OFF filter time, the input value will turn OFF after the input OFF filter time has passed.

When input is ON (ON filter disabled)
If the status of input terminals turns ON, the input value will turn ON immediately.

When input is OFF (OFF filter enabled)
If the status of input terminals turns ON again during the input OFF filter time, the input value stays ON from that time during the input OFF filter time.

You can use this function to set the following parameters.

- Input Filter Value Setting
- Input Filter Mode Setting

The values you can set for the Input Filter Value Setting depend on the model of Digital Input Units.

Target Units	Setting name	Description	Default value *1	Unit
NX-ID3317 NX-ID3417 NX-ID4342 NX-ID4442 NX-ID5342 NX-ID5442	Input Filter Value Setting	Set the filter time for input signals. 0: No Filter 1: 0.25 ms 2: 0.5 ms 3: 1 ms 4: 2 ms 5: 4 ms 6: 8 ms 7: 16 ms 8: 32 ms 9: 64 ms 10: 128 ms 11: 256 ms	3	–
NX-ID3343 NX-ID3443		Set the filter time for input signals. 0: No Filter 1: 1 µs 2: 2 µs 3: 4 µs 4: 8 µs 5: 16 µs 6: 32 µs 7: 64 µs 8: 128 µs 9: 256 µs	4	–
All Units	Input Filter Mode Setting	Set the operating mode for the filter. 0: Enable ON Filter and OFF Filter 1: Enable Only OFF Filter	0	–

*1. If a value is set for the input filter time that is smaller than the default value, incorrect input caused by external noises occurs more easily. If an incorrect input occurs, either change the setting to make a long input filter time or take countermeasures, such as separate the Unit or signal lines and noise source, or protect the Unit or signal lines.

Target NX Units

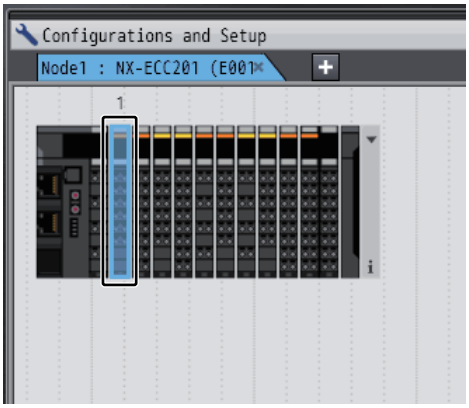
The Digital Input Units that support switching Free-Run refreshing and Synchronous I/O refreshing.

Setting Method

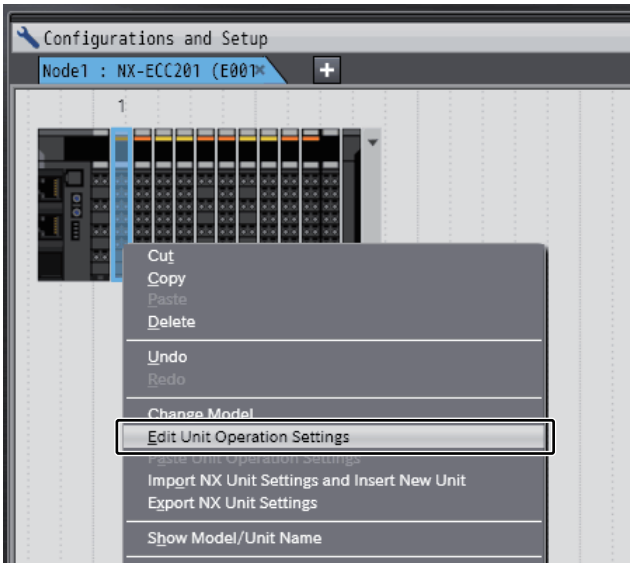
- **Use the Sysmac Studio Ver. 1.06.**

1 Use any of the following methods to display the Unit Operation Settings Edit Tab Page on the Slave Terminal Configuration Edit Tab Page.

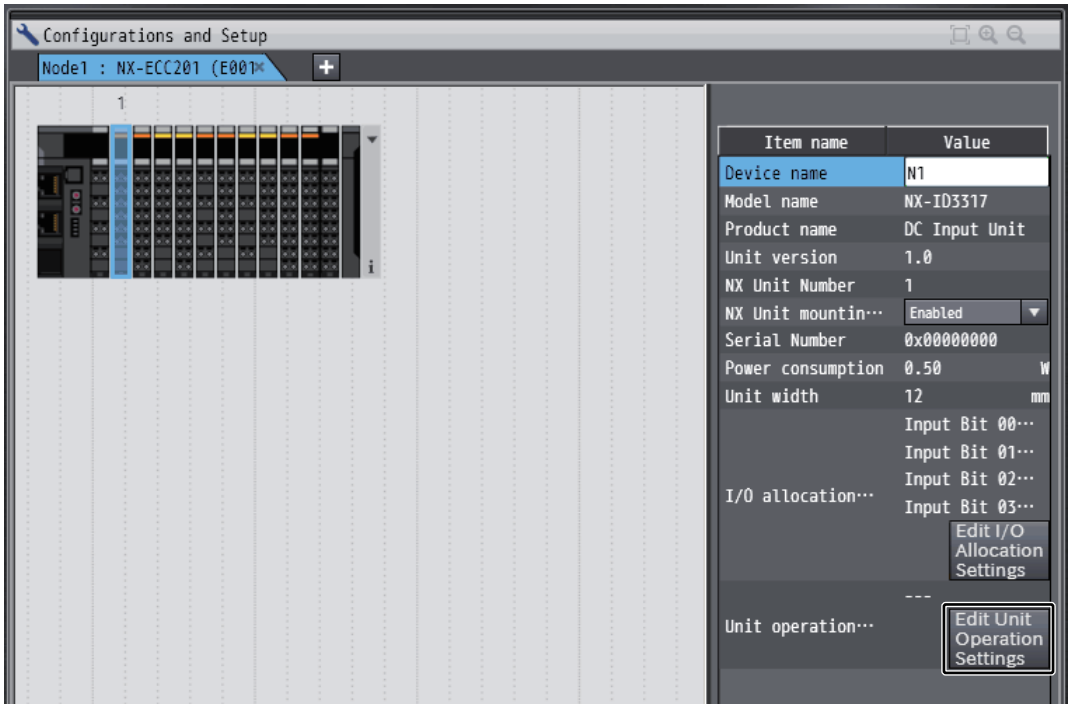
Double-click the NX Unit.



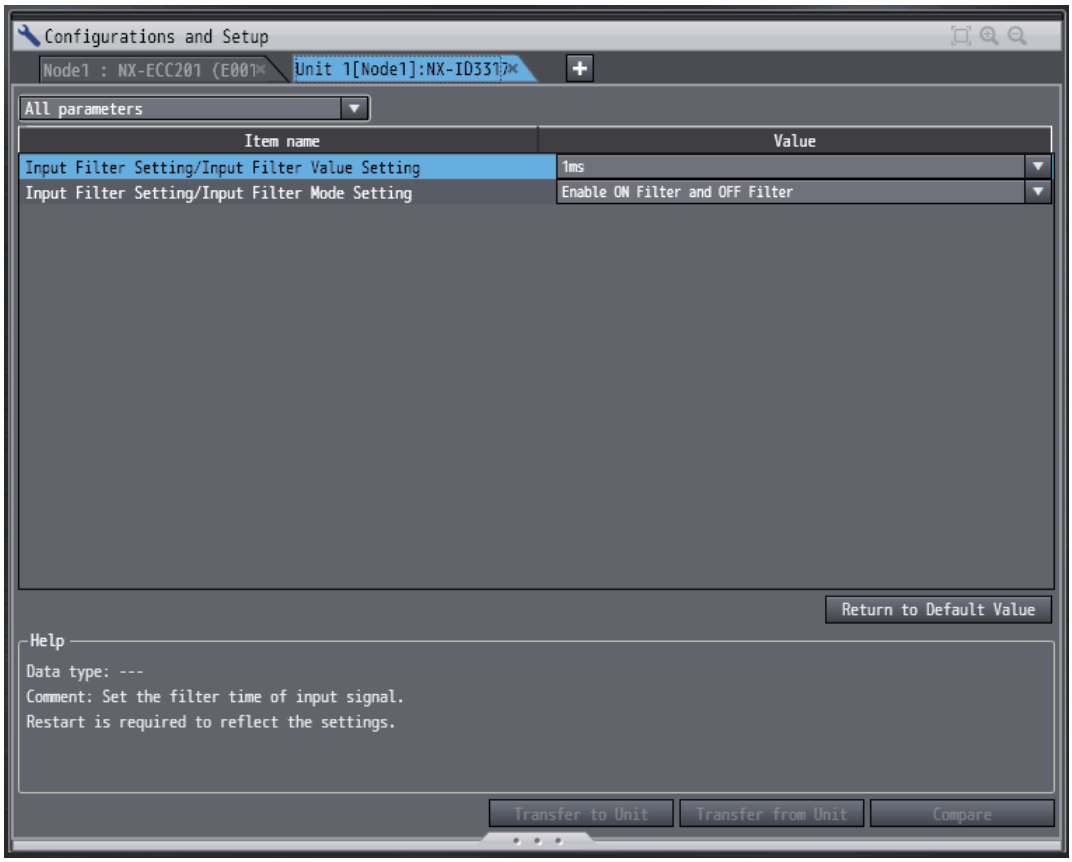
Right-click the NX Unit, then select *Edit Unit Operation Settings* from the menu.



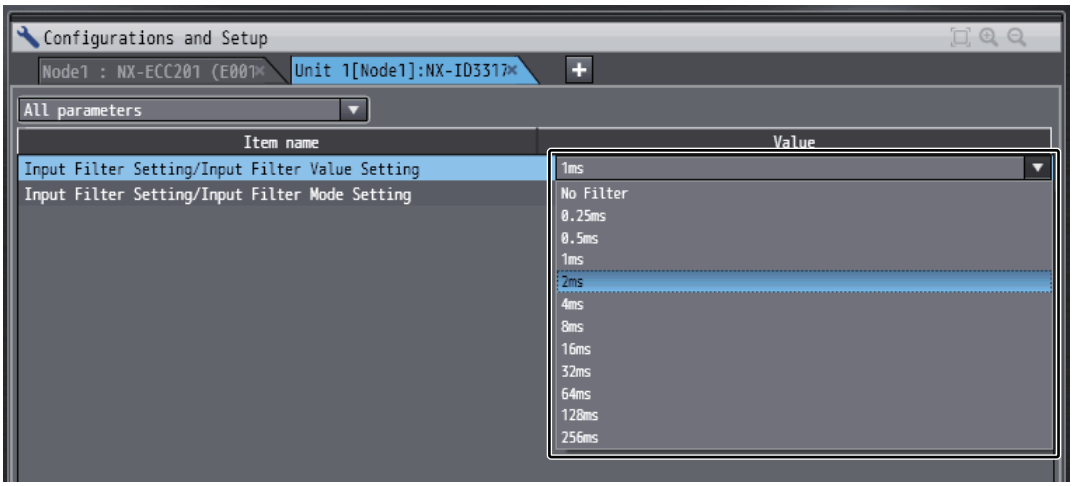
Select the NX Unit, then click the **Edit Unit Operation Settings** Button.



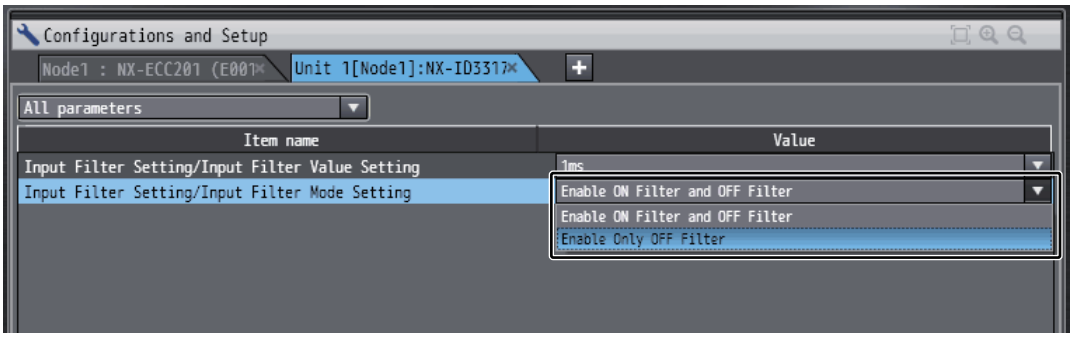
The Unit Operation Settings Edit Tab Page is displayed.



2 Select the filter time you want to set from the upper list of Input Filter Setting.



3 Select the input filter mode you want to set from the lower list of Input Filter Setting.

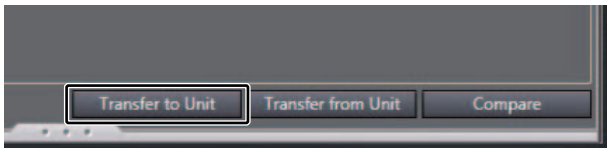


Additional Information

- If you set a value different from the default value, the Value on the Sysmac Studio is displayed in a different color.
- You can click the **Return to Default Value** Button to return all set values on the Sysmac Studio to the default values.
- Help for the settings is displayed at the bottom of the Unit Operation Settings Edit Tab Page.

4 Click the **Transfer to Unit** Button.

The settings are transferred from the Sysmac Studio to the NX Unit.



The settings are reflected after the Unit is restarted.

Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Sysmac Studio is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

Precautions

Note that when you use this function, the time for which the input value actually turns ON or turns OFF is delayed from the initial input to the input terminals until ON delay time or OFF delay time in the following table.

Delay time	Description
ON delay time	ON response time (time required to read input) + input filter time
OFF delay time	OFF response time (time required to read input) + input filter time

7

Digital Output Units

This section describes the types and functions of Digital Output Units and points to consider when these Units are used.

7-1 Types of Digital Output Units 7-2

7-2 Specifications of I/O Data 7-3

7-2-1 Allocable I/O Data 7-3

7-3 List of Settings 7-6

7-4 Function 7-9

7-4-1 List of Digital Output Unit Functions 7-9

7-4-2 Load Rejection Output Setting 7-10

7-4-3 Load Short-circuit Protection 7-16

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7-6 Precautions when Using the Relay Output Units 7-19

7-1 Types of Digital Output Units

Digital Input Units are parts of NX Units, and process outputs of digital signals (ON/OFF signals).

The Digital Output Unit types are described below.

Transistor Output Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Internal I/O common	Maximum value of load current	Rated voltage	I/O refreshing method	ON/OFF response time	Reference
NX-OD3121	4 points	NPN	0.5 A/point, 2 A/Unit	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	0.1 ms max./0.8 ms max.	P. A-15
NX-OD3153				24 VDC		300 ns max./300 ns max.	P. A-16
NX-OD3256		PNP				0.5 ms max./1.0 ms max.	P. A-17
NX-OD3257						300 ns max./300 ns max.	P. A-18
NX-OD4121	8 points	NPN	0.5 A/point, 4 A/Unit	12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-19
NX-OD4256		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-20
NX-OD5121	16 points	NPN		12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-21
NX-OD5256		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-22

Relay Output Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Relay type	Maximum switching capacity	I/O refreshing method	ON/OFF response time	Reference
NX-OC2633	2 points	N.O.	250 VAC/2 A (cosΦ = 1), 250 VAC/2 A (cosΦ = 0.4), 24 VDC/2 A, 4 A/Unit	Free-Run refreshing	15 ms max./15 ms max.	P. A-23

7-2 Specifications of I/O Data

This section describes I/O data for the Digital Output Units.

7-2-1 Allocable I/O Data

This section describes the allocable I/O data in the Digital Output Unit.

An I/O entry mapping is assigned to the I/O allocation settings for the Digital Output Unit.

A specific I/O entry is assigned to the I/O entry mapping for each NX Unit model. These allocations are fixed, so you cannot add others or change them.

An I/O entry means the I/O data described in this section. An I/O entry mapping means a collection of I/O entries.

To assign the I/O allocation information of the EtherCAT Slave Terminal to an NJ-series CPU Unit, use the I/O ports for the allocated I/O data.

To access I/O data with the Read NX Unit Object instruction or the Write NX Unit Object instruction, use the index numbers.

NX Units in Free-Run Refreshing or Synchronous I/O Refreshing

● Two-point Output Units

Data name	Description	Data type	Default value	I/O port name	Index	Subin-dex
Output Bit 00	The output set value for output bit 00.	BOOL	FALSE	Output Bit 00	7000 hex	01 hex
Output Bit 01	The output set value for output bit 01.	BOOL	FALSE	Output Bit 01		02 hex

● Four-point Output Units

Data name	Description	Data type	Default value	I/O port name	Index	Subin-dex
Output Bit 00	The output set value for output bit 00.	BOOL	FALSE	Output Bit 00	7000 hex	01 hex
Output Bit 01	The output set value for output bit 01.	BOOL	FALSE	Output Bit 01		02 hex
Output Bit 02	The output set value for output bit 02.	BOOL	FALSE	Output Bit 02		03 hex
Output Bit 03	The output value for bit 03.	BOOL	FALSE	Output Bit 03		04 hex

● Eight-point Output Units

Data name	Description	Data type	Default value	I/O port name	Index	Subin-dex
Output Bit (8 bits)	The output values for 8 bits. The following 8 BOOL data are included.	BYTE	00 hex	Output Bit (8 bits)	7001 hex	01 hex
Output Bit 00	The output set value for output bit 00.	BOOL	FALSE	Output Bit 00		
Output Bit 01	The output set value for output bit 01.	BOOL	FALSE	Output Bit 01		
Output Bit 02	The output set value for output bit 02.	BOOL	FALSE	Output Bit 02		
Output Bit 03	The output set value for output bit 03.	BOOL	FALSE	Output Bit 03		
Output Bit 04	The output set value for output bit 04.	BOOL	FALSE	Output Bit 04		
Output Bit 05	The output set value for output bit 05.	BOOL	FALSE	Output Bit 05		
Output Bit 06	The output set value for output bit 06.	BOOL	FALSE	Output Bit 06		
Output Bit 07	The output set value for output bit 07.	BOOL	FALSE	Output Bit 07		

● Sixteen-point Output Units

Data name	Description	Data type	Default value	I/O port name	Index	Subin-dex
Output Bit (16 bits)	The output values for 16 bits. The following 16 BOOL data are included.	WORD	0000 hex	Output Bit (16 bits)	7002 hex	01 hex
Output Bit 00	The output set value for output bit 00.	BOOL	FALSE	Output Bit 00		
Output Bit 01	The output set value for output bit 01.	BOOL	FALSE	Output Bit 01		
Output Bit 02	The output set value for output bit 02.	BOOL	FALSE	Output Bit 02		
Output Bit 03	The output set value for output bit 03.	BOOL	FALSE	Output Bit 03		
Output Bit 04	The output set value for output bit 04.	BOOL	FALSE	Output Bit 04		
Output Bit 05	The output set value for output bit 05.	BOOL	FALSE	Output Bit 05		
Output Bit 06	The output set value for output bit 06.	BOOL	FALSE	Output Bit 06		
Output Bit 07	The output set value for output bit 07.	BOOL	FALSE	Output Bit 07		
Output Bit 08	The output set value for output bit 08.	BOOL	FALSE	Output Bit 08		
Output Bit 09	The output set value for output bit 09.	BOOL	FALSE	Output Bit 09		
Output Bit 10	The output set value for output bit 10.	BOOL	FALSE	Output Bit 10		
Output Bit 11	The output set value for output bit 11.	BOOL	FALSE	Output Bit 11		
Output Bit 12	The output set value for output bit 12.	BOOL	FALSE	Output Bit 12		
Output Bit 13	The output set value for output bit 13.	BOOL	FALSE	Output Bit 13		
Output Bit 14	The output set value for output bit 14.	BOOL	FALSE	Output Bit 14		
Output Bit 15	The output set value for output bit 15.	BOOL	FALSE	Output Bit 15		

7-3 List of Settings

The followings are the setting descriptions, setting ranges, and default values of the functions that can be used in the Digital Output Units.

The settings are reflected after the Unit is restarted.

Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Sysmac Studio is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

● Two-point Output Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Load Rejection Output for Output Bit 00	Set the output at load OFF. FALSE: OFF TRUE: Hold the present value.	FALSE	TRUE or FALSE	–	5010 hex	01 hex	P. 7-10
Load Rejection Output for Output Bit 01		FALSE	TRUE or FALSE	–		02 hex	

● Four-point Output Units

Setting name	Description	Default value	Setting range	Unit	Index	Subindex	Reference
Load Rejection Output for Output Bit 00	Set the output at load OFF. FALSE: OFF TRUE: Hold the present value.	FALSE	TRUE or FALSE	–	5010 hex	01 hex	P. 7-10
Load Rejection Output for Output Bit 01		FALSE	TRUE or FALSE	–		02 hex	
Load Rejection Output for Output Bit 02		FALSE	TRUE or FALSE	–		03 hex	
Load Rejection Output for Output Bit 03		FALSE	TRUE or FALSE	–		04 hex	

● Eight-point Output Units

Setting name	Description	Default value	Setting range	Unit	Index	Subin-dex	Refer-ence
Load Rejection Output for Output Bit (8 bits)	Set the output at load OFF in units of 8 bits. Bit 00: Setting for output bit 00 Bit 01: Setting for output bit 01 Bit 02: Setting for output bit 02 Bit 03: Setting for output bit 03 Bit 04: Setting for output bit 04 Bit 05: Setting for output bit 05 Bit 06: Setting for output bit 06 Bit 07: Setting for output bit 07 FALSE: OFF TRUE: Hold the present value.	00 hex	00 to FF hex	–	5011 hex	01 hex	P. 7-10

● Sixteen-point Output Units

Setting name	Description	Default value	Setting range	Unit	Index	Subin-dex	Refer-ence
Load Rejection Output for Output Bit (16 bits)	Set the output at load OFF in units of 16 bits. Bit 00: Setting for output bit 00 Bit 01: Setting for output bit 01 Bit 02: Setting for output bit 02 Bit 03: Setting for output bit 03 Bit 04: Setting for output bit 04 Bit 05: Setting for output bit 05 Bit 06: Setting for output bit 06 Bit 07: Setting for output bit 07 Bit 08: Setting for output bit 08 Bit 09: Setting for output bit 09 Bit 10: Setting for output bit 10 Bit 11: Setting for output bit 11 Bit 12: Setting for output bit 12 Bit 13: Setting for output bit 13 Bit 14: Setting for output bit 14 Bit 15: Setting for output bit 15 FALSE: OFF TRUE: Hold the present value.	0000 hex	0000 to FFFF hex	–	5012 hex	01 hex	P. 7-10

7-4 Function

This section describes the Digital Output Unit functions.

Refer to the specifications of each model in *A-1 Data Sheet* on page A-2 for details on the functions.

7-4-1 List of Digital Output Unit Functions

Function name	Description	Reference
Free-Run Refreshing	With this I/O refreshing method, the refresh cycle of the NX bus and the I/O refresh cycles of the NX Units are asynchronous.	*5-2-4 Free-Run Refreshing* on page 5-4
Synchronous I/O Refreshing	With this I/O refreshing method, the timing to read inputs or to refresh outputs is synchronous on a fixed interval between more than one NX Unit on more than one Slave Terminal.	*5-2-6 Synchronous Output Refreshing* on page 5-12
Load Rejection Output Setting	A function that performs the preset output operation when the Digital Output Unit cannot receive output data due to a host error on the Communications Coupler Unit or an error on the NX bus.	*7-4-2 Load Rejection Output Setting* on page 7-10
Load Short-circuit Protection	A function in which the output will turn OFF to protect the output circuit when an overload or load short-circuit occurs due to a failure of the connected external devices.	*7-4-3 Load Short-circuit Protection* on page 7-16

7-4-2 Load Rejection Output Setting

Purpose

This function maintains a safe output status by performing the preset output operations when Digital Output Units cannot receive the output data from the Communications Coupler Unit due to a host error on the Communications Coupler Unit or an error on the NX bus.

Details on the Function

Sets whether to hold the output or turn it OFF when an error occurred.

Each output bit can be set independently.

● Two-point Output Units

Setting name	Description	Default value	Unit
Load Rejection Output for Output Bit 00	Set the output at load OFF. FALSE: OFF TRUE: Hold the present value.	FALSE	–
Load Rejection Output for Output Bit 01		FALSE	–

● Four-point Output Units

Setting name	Description	Default value	Unit
Load Rejection Output for Output Bit 00	Set the output at load OFF. FALSE: OFF TRUE: Hold the present value.	FALSE	–
Load Rejection Output for Output Bit 01		FALSE	–
Load Rejection Output for Output Bit 02		FALSE	–
Load Rejection Output for Output Bit 03		FALSE	–

● Eight-point Output Units

Setting name	Description	Default value	Unit
Load Rejection Output for Output Bit (8 bits)	Set the output at load OFF in units of 8 bits. Bit 00: Setting for output bit 00 Bit 01: Setting for output bit 01 Bit 02: Setting for output bit 02 Bit 03: Setting for output bit 03 Bit 04: Setting for output bit 04 Bit 05: Setting for output bit 05 Bit 06: Setting for output bit 06 Bit 07: Setting for output bit 07 FALSE: OFF TRUE: Hold the present value.	00 hex	–

● Sixteen-point Output Units

Setting name	Description	Default value	Unit
Load Rejection Output for Output Bit (16 bits)	Set the output at load OFF in units of 16 bits. Bit 00: Setting for output bit 00 Bit 01: Setting for output bit 01 Bit 02: Setting for output bit 02 Bit 03: Setting for output bit 03 Bit 04: Setting for output bit 04 Bit 05: Setting for output bit 05 Bit 06: Setting for output bit 06 Bit 07: Setting for output bit 07 Bit 08: Setting for output bit 08 Bit 09: Setting for output bit 09 Bit 10: Setting for output bit 10 Bit 11: Setting for output bit 11 Bit 12: Setting for output bit 12 Bit 13: Setting for output bit 13 Bit 14: Setting for output bit 14 Bit 15: Setting for output bit 15 FALSE: OFF TRUE: Hold the present value.	0000 hex	–

Target NX Units

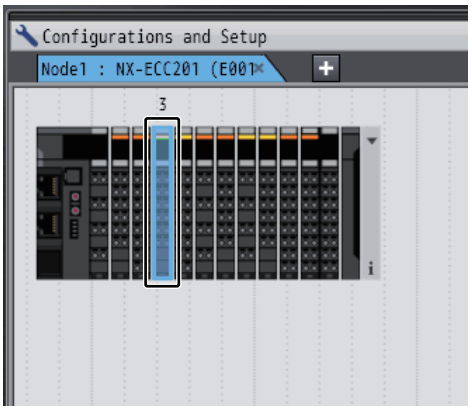
All Digital Output Units

Setting Method

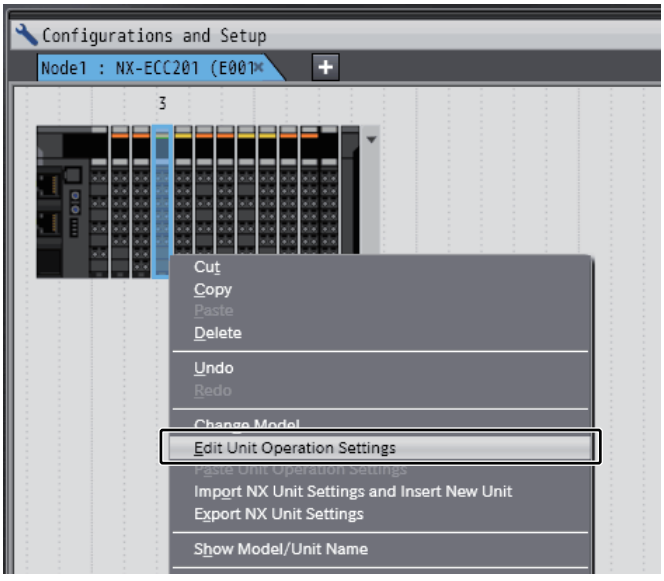
● Use the Sysmac Studio Ver. 1.06.

1 Use any of the following methods to display the Unit Operation Settings Edit Tab Page on the Slave Terminal Configuration Edit Tab Page.

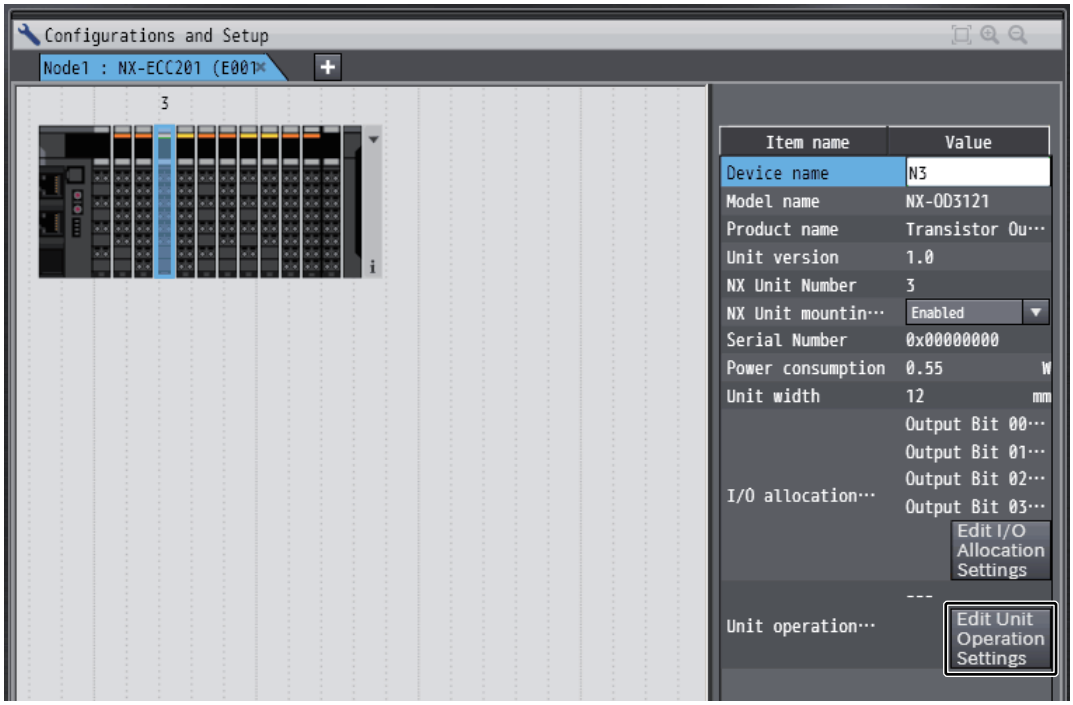
Double-click the NX Unit.



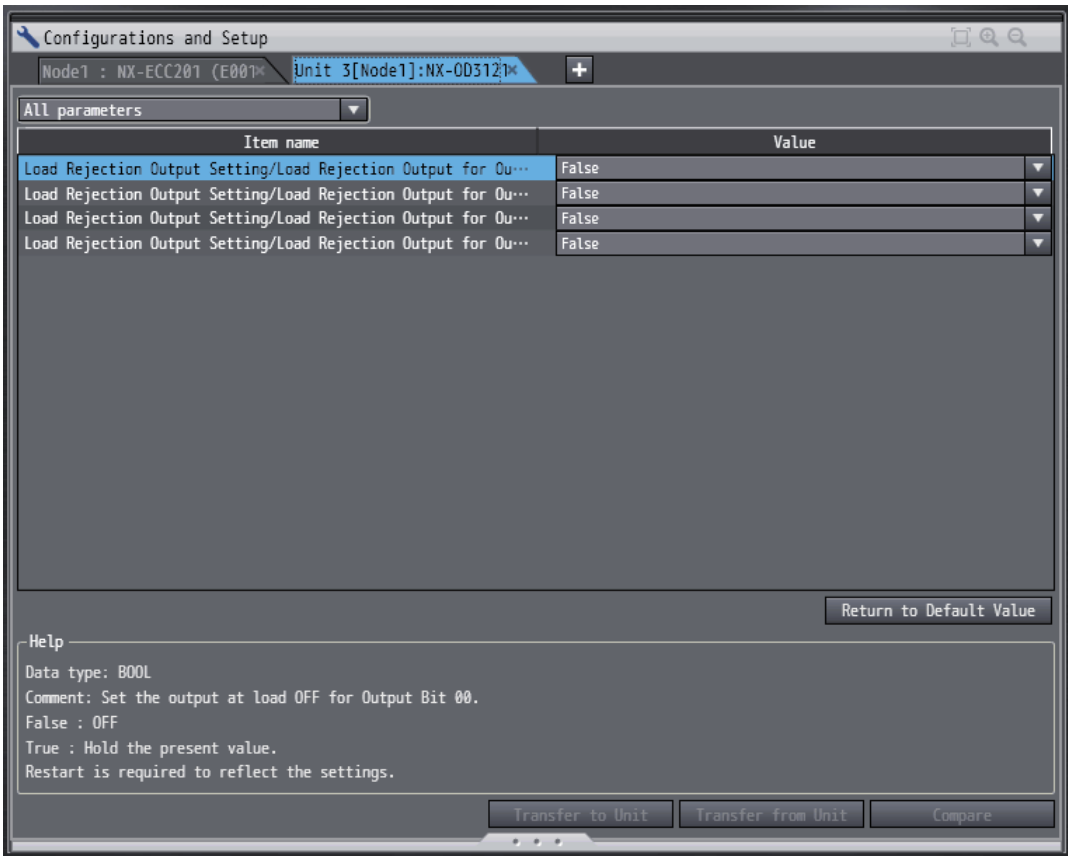
Right-click the NX Unit, then select *Edit Unit Operation Settings* from the menu.



Select the NX Unit, then click the **Edit Unit Operation Settings** Button.



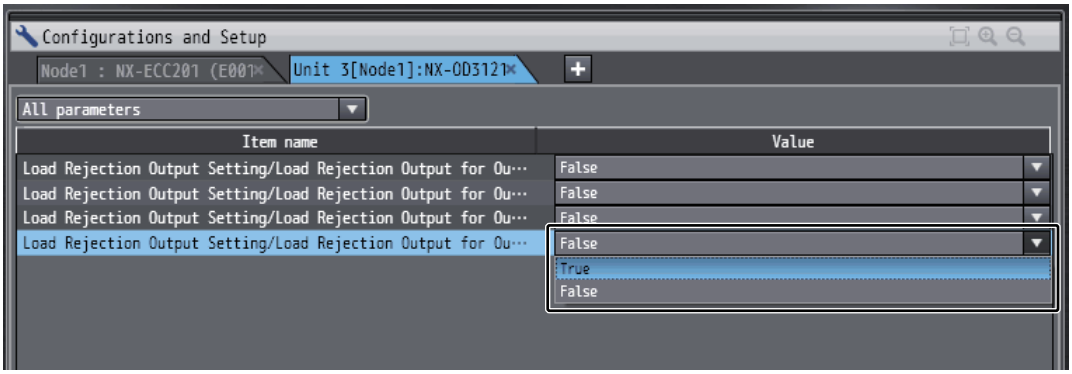
The Unit Operation Settings Edit Tab Page is displayed.



2 Make the following settings according to the type of NX Unit you want to set.

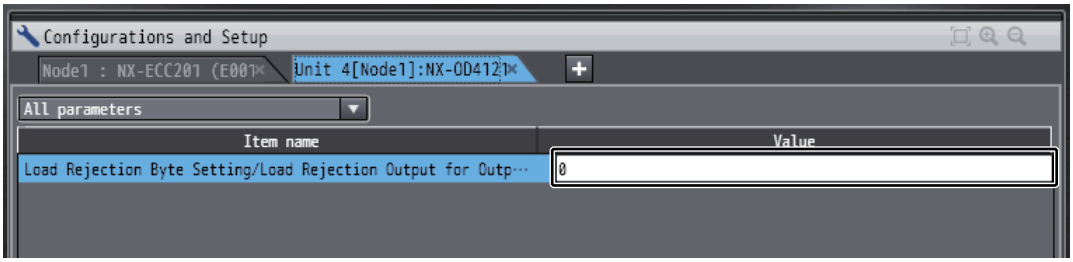
Four-point Output Unit (Data type: BOOL)

Select *False* (OFF) or *True* (Hold the present value) from the list of Load Rejection Output Setting for which the output bit you want to set.



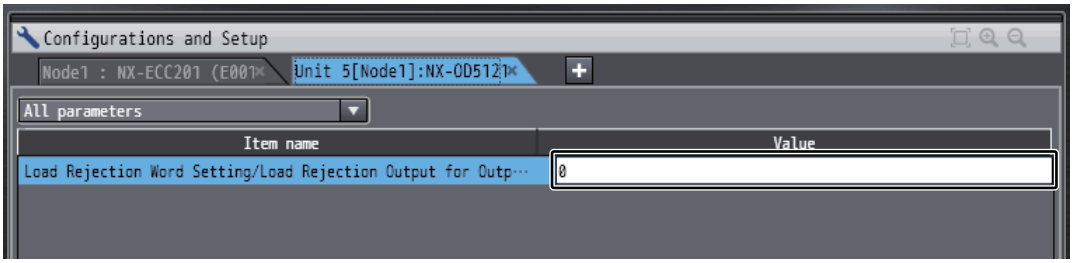
Eight-point Output Unit (Data type: USINT)

Enter a set value (0 to 255) in the Value text box.



Sixteen-point Output Unit (Data type: UINT)

Enter a set value (0 to 65535) in the Value text box.

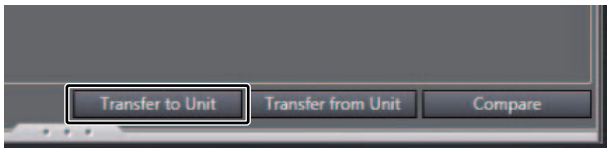


Additional Information

- If you set a value different from the default value, the Value on the Sysmac Studio is displayed in a different color.
- You can click the **Return to Default Value** Button to return all set values on the Sysmac Studio to the default values.
- Help for the settings is displayed at the bottom of the Unit Operation Settings Edit Tab Page.

3 Click the **Transfer to Unit** Button.

The settings are transferred from the Sysmac Studio to the NX Unit.



The settings are reflected after the Unit is restarted.

Precautions for Safe Use

The Unit is required to restart after the transfer of Unit operation settings on the Sysmac Studio is completed. Always sufficiently check the safety at the connected devices before you transfer the Unit operation settings.

7-4-3 Load Short-circuit Protection

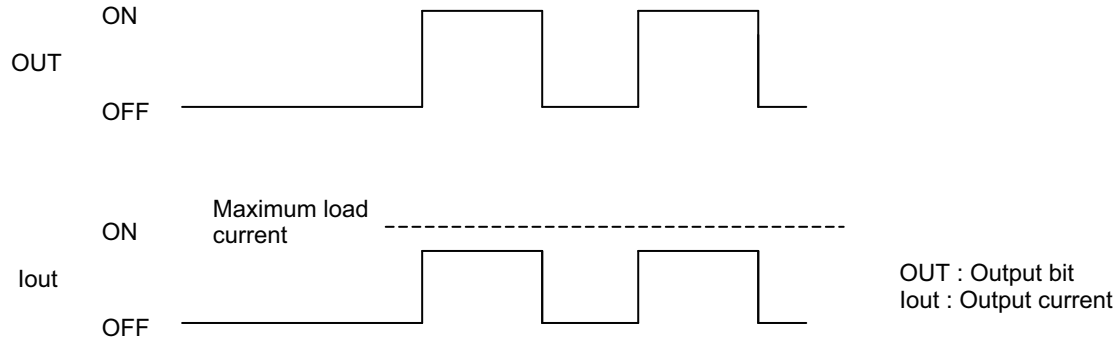
Purpose

This function is used to protect the output circuits of the Digital Output Units when an external connection load short-circuit occurs.

Details on the Function

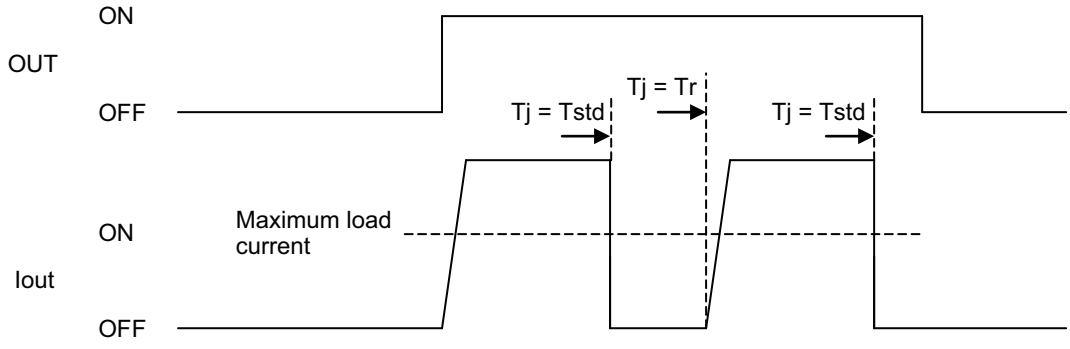
As shown in the figure below, normally when the output bit (OUT) turns ON, the transistor turns ON and then output current (Iout) will flow.

The transistor of the Transistor Output Units generates heat when output current (Iout) flows.



If an overload or short-circuit occurs, causing the output current (Iout) to exceed the maximum value of load current as shown in the figure below and the junction temperature (Tj) of the transistor to reach the thermal shutdown temperature (Tstd) in which a load short-circuit protection operates, the output will turn OFF to protect the transistor from being damaged.

When the junction temperature (Tj) of the transistor drops down to the reset temperature (Tr), the output OFF will be automatically reset and the output current will start flowing.



OUT : Output bit
Iout : Output current
Tj : Junction temperature of transistor
Tstd : Thermal shutdown temperature
Tr : Reset temperature

● Restrictions on Use

The load short-circuit protection function only protects internal circuits for a short period.

As shown in the figure above, the load short-circuit protection of this NX Unit is automatically released when the Tj equals to Tr.

Therefore, unless the cause of short-circuit is removed, ON/OFF operations are repeated in the output.

If the short-circuit is not corrected, output elements deteriorate. If any external load is short-circuited, immediately turn OFF the applicable output and remove the cause of the short-circuit.

Target NX Units

Digital Output Units of PNP outputs

Setting Method

No setting is required.

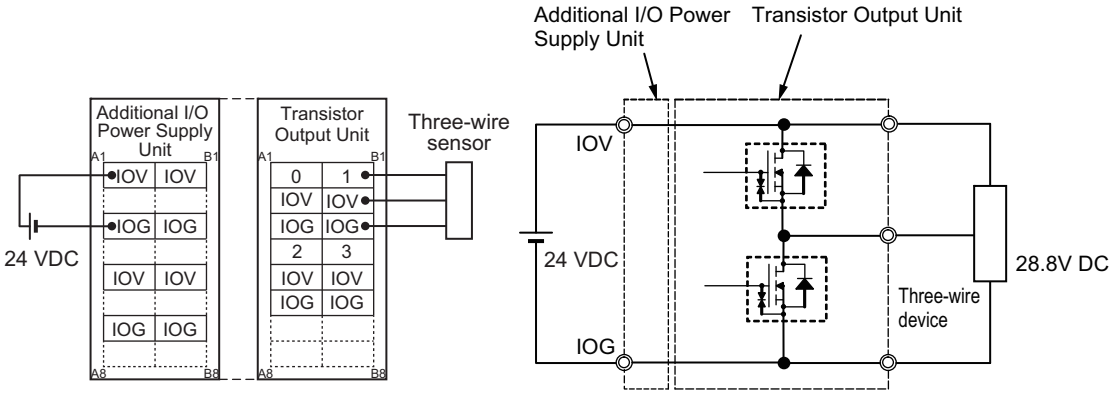
7-5 Push-pull Output

The Digital Output Units with the ON/OFF response time of 1 µs or less use a push-pull output to increase the speed of the output ON/OFF response.

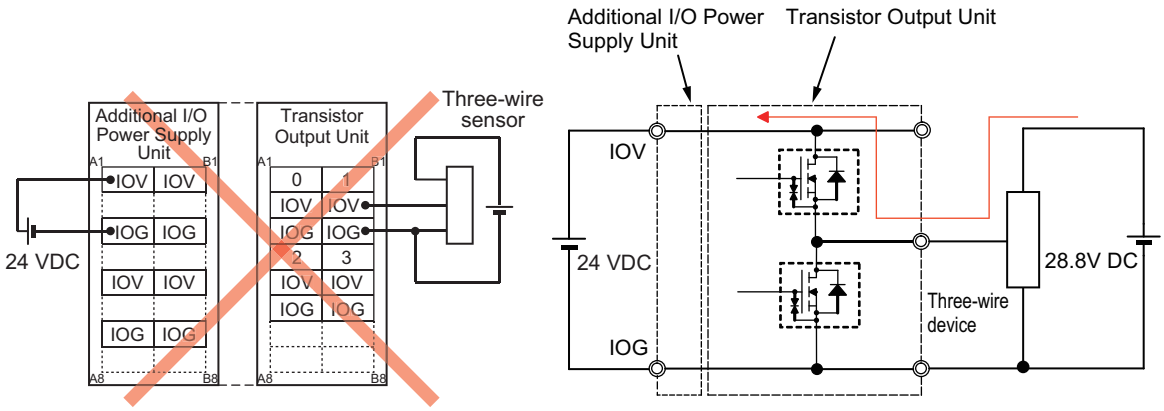
For this type of the Output Units, use the single load power supply for the I/O power and connected external devices.

If multiple power supplies are used, the current may flow into the output bits via the diodes built in the I/O circuit and cause the Output Units to malfunction.

● Good Example



● Bad Example



7-6 Precautions when Using the Relay Output Units

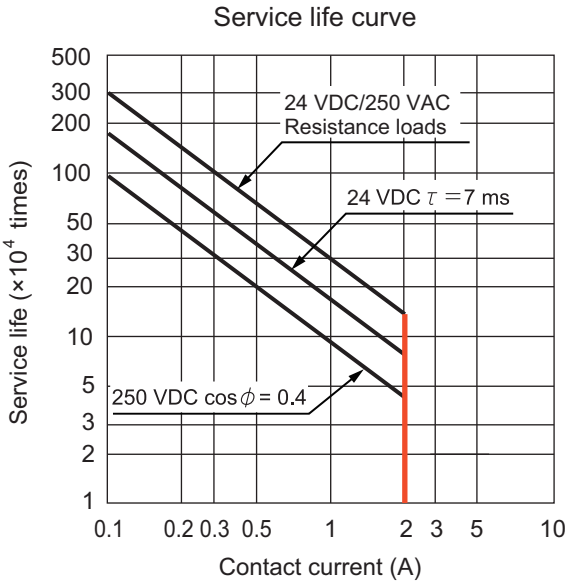
This section describes precautions when using the Relay Output Units.

Relay Service Life

The service life of Relay Output Units depends on the type of load, contact current and ambient temperature.

Use the following diagrams to calculate the relay service life based on the operating conditions, and replace the NX Unit before the end of its service life.

● Contact Current vs. Service Life Characteristic



Switching frequency: 20 operations/minute

Precautions for Correct Use

The above chart shows the life characteristics for individual relays. Do not exceed the specifications of the Relay Output Units. If a switching capacity exceeding the specifications is used, the reliability and life expectancy of other parts will be reduced and the NX Unit may malfunction.

Inductive Load

The life of the Relay varies with the load inductance.

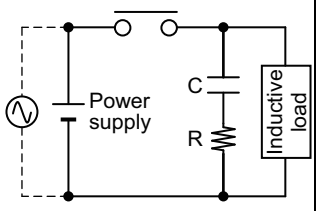
If any inductive load is used, we recommend that you use a contact protection circuit. (*Contact Protection Circuit* on page 7-20).

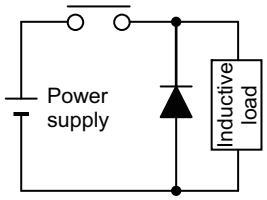
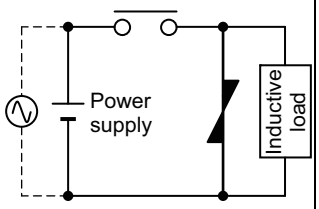
Be sure to connect a contact protection circuit in parallel with every DC inductive load that is connected to the Contact Output Unit because the usage of a contact protection circuit has a significant effect on the service life of the contact.

Contact Protection Circuit

Contact protection circuits are used with the Contact Output Unit in order to prolong the life of each relay mounted to the Contact Output Unit, prevent noise, and reduce the generation of carbide and nitrate deposits caused by arcs. However, if contact protection circuits are used incorrectly, they can reduce relay service life. Using a contact protection circuit can also cause a delay in the resetting time (shut-off time).

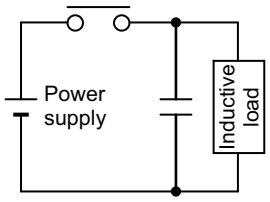
Contact protection circuit examples are listed in the following table.

Circuit		Current		Feature	Required element
		AC	DC		
CR method		Yes	Yes	If the load is a relay or solenoid, there is a delay in the resetting time. If the power supply voltage is 24 or 48 V, connect the contact protection circuit in parallel with the load. If the supply voltage is 100 to 200 V, connect the contact protection circuit between the contacts.	The capacitance of the capacitor should be approx. 1 to 0.5 μF per contact current of 1 A and resistance of the resistor should be approx. 0.5 to 1 Ω per contact voltage of 1 V. C: The capacitance of the capacitor should be approx. 0.5 to 1 μF per contact current of 1 A. R: The resistance of the resistor should be approx. 0.5 to 1 Ω per contact voltage of 1 V. These values, however, vary depending on the load and the characteristics of the relay. Decide these values from experiments, and take into consideration that the capacitance suppresses spark discharge when the contacts are separated and the resistance restricts the current that flows into the load when the circuit is closed again. The dielectric strength of the capacitor must be 200 to 300 V. If the circuit is an AC circuit, use a capacitor with no polarity.

Circuit		Current		Feature	Required element
		AC	DC		
Diode method		×	Yes	The diode connected in parallel with the load changes energy accumulated by the coil into a current, which then flows into the coil so that the current will be converted into Joule heat by the resistance of the inductive load. The delay in resetting time caused by this method is longer than that caused by the CR method.	The reversed dielectric strength value of the diode must be at least 10 times as large as the circuit voltage value. The forward current of the diode must be the same as or larger than the load current. The reversed dielectric strength value of the diode may be two to three times larger than the power supply voltage if the contact protection circuit is applied to electronic circuits with low circuit voltages.
Varistor method		Yes	Yes	The varistor method prevents the imposition of high voltage between the contacts by using the constant voltage characteristic of the varistor. There is a delay in the resetting time. If the power supply voltage is 24 to 48 V, insert the varistor in parallel with the load. If the supply voltage is 100 to 200 V, insert the varistor between the contacts.	-

Precautions for Correct Use

Do not connect a contact protection circuit with an inductive load as shown in the diagram below.



This contact protection circuit is very effective for preventing spark discharge when the circuit is opened. However, when the contacts are closed, the contacts may be welded due to the current charged in the capacitor. DC inductive loads can be more difficult to switch than resistive loads. If an appropriate contact protection circuit is used, however, DC inductive loads are as easy to switch as resistive loads.

8

Troubleshooting

This section describes the error information and corrections for errors that can occur when the Digital I/O Units are used.

8-1 How to Check for Errors 8-2

8-2 Checking for Errors with the Indicators 8-3

8-3 Checking for Errors and Troubleshooting on the Sysmac Studio 8-5

8-3-1 Checking for Errors from the Sysmac Studio 8-5

8-3-2 Event Codes and Corrections for Errors 8-8

8-3-3 Meaning of Error 8-10

8-4 Resetting Errors 8-15

8-5 Troubles Specific To Each Type of NX Units 8-16

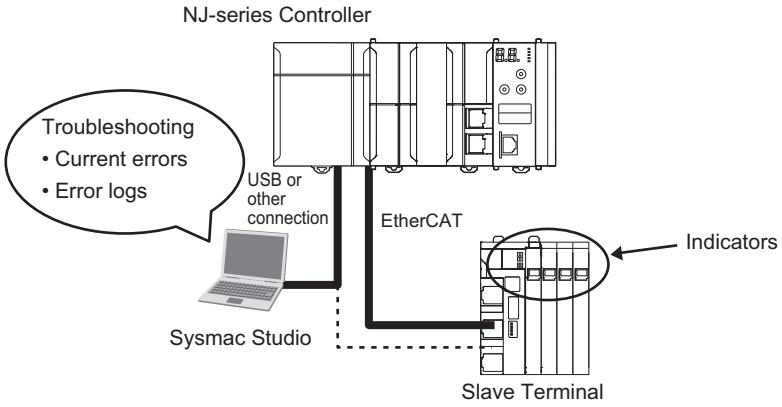
8-5-1 Digital Input Units 8-16

8-5-2 Digital Output Units 8-16

8-6 Troubleshooting Flowchart 8-18

8-1 How to Check for Errors

You can check the status of errors on the Slave Terminal with the following methods.



Checking method	What you can check
Checking the indicators	Status of Units and degree of error
Troubleshooting with Sysmac Studio	You can check for current Controller errors, a log of past Controller errors, error sources, error causes, and corrections.

Note With an NS-series PT, you can check on an error occurring in an EtherCAT Coupler Unit and some of the NX Units, and check which NX Unit the error occurred on.

If you use an NJ-series Controller, refer to the *NJ-series Troubleshooting Manual* (Cat. No. W503) for information on how to check for errors in the entire Controller.

8-2 Checking for Errors with the Indicators

You can use the TS indicators on the NX Units to check the NX Unit status and level of errors.

This section describes the meanings of errors that the TS indicator shows and the troubleshooting procedures for them.

In this section, the status of the indicator is indicated with the following abbreviations.

Abbreviation	Indicator status
Lit	Lit
Not Lit	Not lit
FS ( )	Flashing. The numeric value in parentheses is the flashing interval.
–	Undefined

Main Errors and Corrections

TS indicator		Cause	Correction
Green	Red		
Lit	Not Lit	–	– (This is the normal status.)
FS (2 s)	Not Lit	• Initializing • Downloading	–(Normal. Wait until the processing is completed.)
Lit	Lit	This status is not present.	
Not Lit	Not Lit	The Unit power supply is not supplied.	Check the following items and supply the Unit power supply correctly. [Check items for power supply] • Make sure that the power supply cable is wired correctly. • Make sure that the power supply cable is not disconnected. • Make sure that power supply voltage is within the specified range. • Make sure that the power supply has enough capacity. • Make sure that power supply has not failed.
		• Waiting for initialization to start • Restarting	- (Normal. Wait until the processing is completed.)
		If you cannot resolve the problem after you check the above items and cycle the Slave Terminal power supply, the Unit may have a hardware failure. If this happens, replace the Unit.	
Not Lit	Lit	Hardware failure	If this error occurs after you cycle the Slave Terminal power supply, replace the Unit.
Not Lit	Lit	Non-volatile Memory Hardware Error	Refer to Event *Non-volatile Memory Hardware Error* on page 8-11.
Not Lit	Lit	Control Parameter Error in Master	Refer to Event *Control Parameter Error in Master* on page 8-11.
Not Lit	FS (1 s)	NX Unit I/O Communications Error	Refer to Event *NX Unit I/O Communications Error* on page 8-12.

TS indicator		Cause	Correction
Green	Red		
Not Lit	FS (1 s)	NX Unit Output Synchronization Error	Refer to Event *NX Unit Output Synchronization Error* on page 8-13.
Not Lit	Lit	NX Unit Clock Not Synchronized Error	Refer to Event *NX Unit Clock Not Synchronized Error* on page 8-14.

8-3 Checking for Errors and Troubleshooting on the Sysmac Studio

Error management on the NX Series is based on the methods used for the NJ-series Controllers.

This allows you to use the Sysmac Studio to check the meanings of errors and troubleshooting procedures.

8-3-1 Checking for Errors from the Sysmac Studio

When an error occurs, you can place the Sysmac Studio online to the Controller or the Communications Coupler Unit to check current Controller errors and the log of past Controller errors.

The methods that are used to check errors depend on the Controller you use.

Controller used	Sysmac Studio connection	Scope of check	Remarks
NJ-series Controller	NJ-series CPU Unit	You can check the errors that are managed by the Controller. This includes errors for the connected EtherCAT Slave Terminals.	You cannot check errors if there is a fatal error in the CPU Unit.
	EtherCAT Coupler Unit	You can check the errors that are managed by the EtherCAT Coupler Unit. You can check errors in the EtherCAT Coupler Unit to which the Sysmac Studio is connected, and errors in the NX Units that are connected after the EtherCAT Coupler Unit.	• You can check errors in the Slave Terminals even if there is a fatal error in the CPU Unit. • You cannot check errors if there is a fatal error in the EtherCAT Coupler Unit. • Some errors in the NX Units cannot be checked if a fatal error occurs in that NX Unit.*1
Other controllers	EtherCAT Coupler Unit	Same as above.	Same as above.

*1. On NX Units that manage their own errors, current errors cannot be checked after a fatal error occurs in that NX Unit. On NX Units that record their own event logs, the error log cannot be checked after a fatal error occurs in that NX Unit.

Refer to the *NJ-series Troubleshooting Manual* (Cat. No. W503) for information on NJ-series error management methods.

Refer to the *NJ-Series Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for details on troubleshooting with the Sysmac Studio.

If you cannot check the error on the Sysmac Studio, check the error by following the flow outlined in *8-6 Troubleshooting Flowchart* on page 8-18.

Additional Information

Checking Errors in an EtherCAT Slave Terminal with an NS-series PT

You can use an NS-series PT to view current errors on the EtherCAT Coupler Unit errors and some of the NX Units as well as information on the NX Units in which current errors occurred. You cannot use it to check event logs and details on current errors in the NX Units.

Current Errors

Open the Sysmac Studio's Controller Error Tab Page to check the current error's level, source, source details, event name, event codes, details, attached information 1 to 4, and correction. Errors in the observation level are not displayed.

Additional Information

Number of Current Errors

The following table gives the number of errors that are reported simultaneously as current errors in each Unit.

Unit	Number of simultaneous error notifications
EtherCAT Coupler Unit	128 errors
Digital I/O Unit	Since current errors are managed in the Communications Coupler Unit, the number of current errors is limited by the number of errors for the Communications Coupler Unit.

If the number of errors exceeds the maximum number of reportable current errors, errors are reported with a priority given to the oldest and highest-level errors. Errors that exceed the limit on simultaneous error notifications are not reported.

Errors that are not reported are still reflected in the error status.

Log of Past Errors

Open the Sysmac Studio's Controller Event Log Tab Page to check the times, levels, sources, source details, event names, event codes, details, attached information 1 to 4, and corrections for previous errors.

Additional Information

Number of Logs of Past Errors

Each event log can contain the following number of records. If the number of events exceeds the following number of records, the oldest events are overwritten.

Event logs in the Digital I/O Units are stored in the EtherCAT Coupler Unit.

Event log category	Types of Units	
	EtherCAT Coupler Unit	Digital I/O Units
System event log	Total: 128 events	
Access event log	Total: 32 events	

Refer to the *NJ-series Troubleshooting Manual* (Cat. No. W503) and the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for the items that you can check and the procedures to check for errors.
Refer to *8-3-2 Event Codes and Corrections for Errors* on page 8-8 for details on event codes.

8-3-2 Event Codes and Corrections for Errors

The errors (i.e.,events) that occur in the Digital I/O Unit is shown below.

The following abbreviations are used in the event level column.

Abbreviation	Name
Maj	Major fault level
Prt	Partial fault level
Min	Minor fault level
Obs	Observation
Info	Information

Refer to the *NJ-series Troubleshooting Manual* (Cat. No. W503) for all NJ-series event codes.

Event code	Event name	Meaning	Assumed cause	Level					Reference
				Maj	Prt	Min	Obs	Info	
00200000 hex	Non-volatile Memory Hardware Error	An error occurred in non-volatile memory.	• Non-volatile memory failure			Yes			P. 8-11
10410000 hex	Control Parameter Error in Master	An error occurred in the control parameters that are saved in the master.	• There is an error in the area of the non-volatile memory in the Communications Coupler Unit in which the control parameters for the NX Unit are saved. • The power supply to the NX Unit was turned OFF or Sysmac Studio communications were disconnected while writing the control parameters.			Yes			P. 8-11
80200000 hex	NX Unit I/O Communications Error	An I/O communications error occurred between the Communications Coupler Unit and the NX Unit.	• The NX Unit is not mounted properly. • There is a hardware error in the NX Unit.			Yes			P. 8-12
80210000 hex	NX Unit Output Synchronization Error	An output synchronization error occurred in the NX Unit.	• The NX Unit is not mounted properly. • The Slave Terminal Configuration Information when the EtherCAT Coupler Unit synchronization settings were downloaded did not agree with the actual configuration of the Slave Terminal. • There is an NX Unit that cannot be synchronized to the specified output synchronization timing. (This will not cause an error when the synchronization setting is made from the Sysmac Studio.)			Yes			P. 8-13

Event code	Event name	Meaning	Assumed cause	Level					Reference
				Maj	Prt	Min	Obs	Info	
8024 0000 hex	NX Unit Clock Not Synchro-nized Error	An error occurred in the clock informa-tion between the EtherCAT Coupler Unit and the NX Unit.	• There is a hardware error in the NX Unit.			Yes			P. 8-14
9040 0000 hex	Event Log Cleared	The event log was cleared.	• The event log was cleared by the user.					Yes	P. 8-14

8-3-3 Meaning of Error

This section describes the information that is given for individual errors.

Error Descriptions

The items that are used to describe individual errors (events) are described in the following copy of an error table.

<table>
<tr><td>Event name</td><td colspan="3">Gives the name of the error.</td><td>Event code</td><td colspan="2">Gives the code of the error.</td></tr>
<tr><td>Meaning</td><td colspan="6">Gives a short description of the error.</td></tr>
<tr><td>Source</td><td colspan="2">Gives the source of the error.</td><td>Source details</td><td>Gives details on the source of the error.</td><td>Detection timing</td><td>Tells when the error is detected.</td></tr>
<tr><td>Error attributes</td><td>Level</td><td>Tells the level of influence on control.*1</td><td>Recovery</td><td>Gives the recovery method.*2</td><td>Log category</td><td>Tells which log the error is saved in.*3</td></tr>
<tr><td>Effects</td><td>User program</td><td>Tells what will happen to execution of the user program.*4</td><td>Operation</td><td colspan="3">Provides special information on the operation that results from the error.</td></tr>
<tr><td>Indicators</td><td colspan="6">Gives the status of the built-in EtherNet/IP port and built-in EtherCAT port indicators. Indicator status is given only for errors in the EtherCAT Master Function Module and the EtherNet/IP Function Module.</td></tr>
<tr><td rowspan="2">System-defined variables</td><td colspan="2">Variable</td><td colspan="2">Data type</td><td colspan="2">Name</td></tr>
<tr><td colspan="6">Lists the variable names, data types, and meanings for system-defined variables that provide direct error notification, that are directly affected by the error, or that contain settings that cause the error.</td></tr>
<tr><td rowspan="2">Cause and correction</td><td colspan="2">Assumed cause</td><td colspan="2">Correction</td><td colspan="2">Prevention</td></tr>
<tr><td colspan="6">Lists the possible causes, corrections, and preventive measures for the error.</td></tr>
<tr><td>Attached information</td><td colspan="6">This is the attached information that is displayed by the Sysmac Studio or an NS-series PT.</td></tr>
<tr><td>Precautions/ Remarks</td><td colspan="6">Provides precautions, restrictions, and supplemental information. If the user can set the event level, the event levels that can be set, the recovery method, operational information, and other information are also provided.</td></tr>
</table>

*1. One of the following:
Major fault: Major fault level
Partial fault: Partial fault level
Minor fault: Minor fault level
Observation
Information

*2. One of the following:
Automatic recovery: Normal status is restored automatically when the cause of the error is removed.
Error reset: Normal status is restored when the error is reset after the cause of the error is removed.
Cycle the power supply: Normal status is restored when the power supply to the Controller is turned OFF and then back ON after the cause of the error is removed.
Controller reset: Normal status is restored when the Controller is reset after the cause of the error is removed.
Depends on cause: The recovery method depends on the cause of the error.

*3. One of the following:
System: System event log
Access: Access event log

*4. One of the following:
Continues: Execution of the user program will continue.
Stops: Execution of the user program stops.
Starts: Execution of the user program starts.

Event name	Non-volatile Memory Hardware Error		Event code	00200000 hex	
Meaning	An error occurred in non-volatile memory.				
Source	Depends on where the Sysmac Studio is connected and the system configuration.	Source details	NX Unit	Detection timing	When power is turned ON to the NX Unit
Error attributes	Level	Minor fault	Recovery	Cycle the power supply to the NX Unit.	Log category	System
Effects	User program	Continues.	Operation	I/O refreshing for the NX Unit stops. Messages cannot be sent to the NX Unit.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	Non-volatile memory failure		Replace the NX Unit.		None	
Attached information	None					
Precautions/ Remarks	None					

Event name	Control Parameter Error in Master		Event code	10410000 hex	
Meaning	An error occurred in the control parameters that are saved in the master.				
Source	Depends on where the Sysmac Studio is connected and the system configuration.	Source details	NX Unit	Detection timing	When power is turned ON to the NX Unit
Error attributes	Level	Minor fault	Recovery	Cycle the power supply to the Communications Coupler Unit and the NX Unit.	Log category	System
Effects	User program	Continues.	Operation	I/O refreshing for the NX Unit stops. Messages cannot be sent to the NX Unit.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	There is an error in the area of the non-volatile memory in the Communications Coupler Unit in which the control parameters for the NX Unit are saved.		Write the control parameters again and restart the Communications Coupler Unit. If the error occurs again even after you make the above correction, replace the Communications Coupler Unit.		Do not turn OFF the power supply to the NX Unit or disconnect Sysmac Studio communications while the control parameters are being written.	
	The power supply to the NX Unit was turned OFF or Sysmac Studio communications were disconnected while writing the control parameters.					
Attached information	None					
Precautions/ Remarks	None					

Event name	NX Unit I/O Communications Error		**Event code**	80200000 hex		
Meaning	An I/O communications error occurred between the Communications Coupler Unit and the NX Unit.					
Source	Depends on where the Sysmac Studio is connected and the system configuration.		**Source details**	NX Unit	**Detection timing**	Continuously
Error attributes	**Level**	Minor fault	**Recovery**	Reset error in the NX Unit.	**Log category**	System
Effects	**User program**	Continues.	**Operation**	The NX Unit will continue to operate. Input data: Updating input values stops. Output data: The output values depend on the Load Rejection Output Setting.		
System-defined variables	**Variable**		**Data type**		**Name**	
	None		---		---	
Cause and correction	**Assumed cause**		**Correction**		**Prevention**	
	The NX Unit is not mounted properly.		Mount the NX Units and End Cover securely and secure them with End Plates.		Mount the NX Units and End Cover securely and secure them with End Plates.	
	There is a hardware error in the NX Unit.		If the error occurs again even after you make the above correction, replace the NX Unit.		None	
Attached information	None					
Precautions/ Remarks	None					

Event name	NX Unit Output Synchronization Error		Event code	80210000 hex	
Meaning	An output synchronization error occurred in the NX Unit.				
Source	Depends on where the Sysmac Studio is connected and the system configuration.	Source details	NX Unit	Detection timing	Continuously
Error attributes	Level: Minor fault	Recovery	Reset error in the NX Unit.	Log category	System
Effects	User program: Continues.	Operation	The NX Unit will continue to operate. Input data: Updating input values stops. Output data: The output values depend on the Load Rejection Output Setting.		

System-defined variables	Variable	Data type	Name
	None	---	---

Cause and correction	Assumed cause	Correction	Prevention
	The NX Unit is not mounted properly.	Mount the NX Units and End Cover securely and secure them with End Plates.	Mount the NX Units and End Cover securely and secure them with End Plates.
	The Slave Terminal Configuration Information when the EtherCAT Coupler Unit synchronization settings were downloaded did not agree with the actual configuration of the Slave Terminal.	Correct the actual configuration of the Slave Terminal so that it agrees with the Slave Terminal Configuration Information when the EtherCAT Coupler Unit synchronization settings are downloaded. Or, download synchronization settings that agree with the actual configuration of the Slave Terminal.	Correct the actual configuration of the Slave Terminal so that it agrees with the Slave Terminal Configuration Information when the EtherCAT Coupler Unit synchronization settings are downloaded. Or, download synchronization settings that agree with the actual configuration of the Slave Terminal.
	There is an NX Unit that cannot be synchronized to the specified output synchronization timing. (This will not cause an error when the synchronization setting is made from the Sysmac Studio.)	Adjust the timing of output synchronization to the slowest NX Unit of the NX Units to synchronize.	Adjust the timing of output synchronization to the slowest NX Unit of the NX Units to synchronize.

Attached information	None
Precautions/ Remarks	None

Event name	NX Unit Clock Not Synchronized Error			Event code	80240000 hex	
Meaning	An error occurred in the clock information between the EtherCAT Coupler Unit and the NX Unit.					
Source	Depends on where the Sysmac Studio is connected and the system configuration.		Source details	NX Unit	Detection timing	Continuously
Error attributes	Level	Minor fault	Recovery	Cycle the power supply to the EtherCAT Coupler Unit and the NX Unit.	Log category	System
Effects	User program	Continues.	Operation	The NX Unit will continue to operate. Input data: Updating input values stops. Output data: The output values depend on the Load Rejection Output Setting.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	There is a hardware error in the NX Unit.		Replace the NX Unit.		None	
Attached information	None					
Precautions/ Remarks	None					

Event name	Event Log Cleared			Event code	90400000 hex	
Meaning	The event log was cleared.					
Source	Depends on where the Sysmac Studio is connected and the system configuration.		Source details	NX Unit	Detection timing	When commanded from user
Error attributes	Level	Information	Recovery	---	Log category	Access
Effects	User program	Continues.	Operation	Not affected.		
System-defined variables	Variable		Data type		Name	
	None		---		---	
Cause and correction	Assumed cause		Correction		Prevention	
	The event log was cleared by the user.		---		---	
Attached information	Attached information: Events that were cleared 1: The system event log was cleared. 2: The access event log was cleared.					
Precautions/ Remarks	None					

8-4 Resetting Errors

Current errors in a Slave Terminal are retained, unless you reset them, until you cycle the power supply or restart the Slave Terminal.

To reset errors, you must remove the cause of the current error. If you reset an error without removing the cause, the same error will occur again.

Precautions for Correct Use

Resetting the errors does not remove the cause of the error.

Always remove the cause of the error, and then reset the error.

You can use the following methods to reset errors in a Slave Terminal.

Method	Operation	Scope of error reset	Description
Commands from Sysmac Studio	Resetting Controller errors	All errors in the Controller	Reset the Controller error from the Troubleshooting Dialog Box on the Sysmac Studio.
		All errors in the Slave Terminal	Refer to the user's manual of the Communications Coupler Unit for details on resetting errors in the EtherCAT Slave Terminal.
		Errors for individually specified NX Units	
	Clearing all memory for the Slave Terminal	All errors in the Slave Terminal	If the causes for the Controller errors are removed, all Controller errors in the Slave Terminals are reset.
	Restarting Slave Terminals		
Commands from the user program	Resetting Controller errors in the EtherCAT Master Function Module	All errors in the EtherCAT Master Function Module	Execute the Reset EtherCAT Error (ResetECError) instruction in the user program of the NJ-series Controller.
Cycling the Unit power supply to the Slave Terminal	---	All errors in the Slave Terminal	If the causes for the Controller errors are removed, all Controller errors in the Slave Terminals are reset.

Note On the NS-Series PT, you can only reset all errors for the entire Controller.

Refer to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504-E1-07 or later) for Sysmac Studio operating procedures.

For details on the Reset EtherCAT Error (ResetECError) instruction, refer to the *NJ-series Instructions Reference Manual* (Cat. No. W502).

8-5 Troubles Specific To Each Type of NX Units

8-5-1 Digital Input Units

Problem	Assumed cause	Correction	Reference
Although a connected external device is ON, nothing is input and the input indicator is not lit either.	The I/O power is not supplied.	Check that the I/O power is supplied.	P. 4-8
	The I/O power supply voltage is outside the rated range.	Set the I/O power supply voltage within the rated range.	P. A-5
	The Unit is not wired correctly with the connected external device.	Check the wiring with the connected external device.	P. A-5
	The wiring to the connected external device is disconnected.	Check the wiring with the connected external device.	P. A-5
	A connected external device is defective.	Replace the connected external device.	P. A-5
A connected external device is ON and the input indicator is lit, but nothing is input.	A communications error occurred.	Check if a communications (NX bus) error occurred.	P. 8-5
There is a delay in the ON and OFF timing for input values.	An input filter may be set.	Set the input filter value to 0. Alternatively, change the input filter to an appropriate value.	P. 6-11

8-5-2 Digital Output Units

Problem	Assumed cause	Correction	Reference
When the output is ON, nothing is output although the output indicator is lit.	The I/O power is not supplied.	Check that the I/O power is supplied.	P. 4-8
	The I/O power supply voltage is outside the rated range.	Set the I/O power supply voltage within the rated range.	P. A-5
	The Unit is not wired correctly with the connected external device.	Check the wiring with the connected external device.	P. A-5
	The wiring to the connected external device is disconnected.	Check the wiring with the connected external device.	P. A-5
	A connected external device is defective.	Replace the connected external device.	P. A-5
Although the output is ON, nothing is output and the output indicator is not lit either.	A communications error occurred.	Check if a communications (NX bus) error occurred.	P. 8-5
Cannot hold outputs when communications errors occur.	The load rejection output setting is set to "OFF".	Set the load rejection output setting to "Hold the present value".	P. 7-10

Problem	Assumed cause	Correction	Reference
Cannot clear outputs when communications errors occur.	The load rejection output setting is set to "Hold the present value".	Set the load rejection output setting to "OFF".	P. 7-10

8-6 Troubleshooting Flowchart

Refer to the *NX-series EtherCAT Coupler Unit User's Manual* (Cat. No. W519) for information on the standard troubleshooting flowcharts.

9

Inspection and Maintenance

This section describes how to clean, inspect, and maintain the system.

9-1 Cleaning and Inspection 9-2
9-1-1 Cleaning 9-2
9-1-2 Periodic Inspection 9-2
9-2 Maintenance Procedures 9-5
9-2-1 Backing Up Data 9-5
9-2-2 Replacement Procedure for NX Units 9-6

9-1 Cleaning and Inspection

This section describes daily device maintenance such as cleaning and inspection.

Make sure to perform daily or periodic inspections in order to maintain the Digital I/O Unit's functions in the best operating condition.

9-1-1 Cleaning

Perform the following cleaning procedures periodically to ensure Digital I/O Units are maintained in the best operating condition.

- Wipe the equipment over with a soft, dry cloth when performing daily cleaning.
- If dirt remains even after wiping with a soft, dry cloth, wipe with a cloth that has been wet with a sufficiently diluted detergent (2%) and wrung dry.
- Units will become stained if items such as rubber, vinyl products, or adhesive tape are left on the NX Unit for a long period. Remove such items during regular cleaning.

Precautions for Correct Use

- Never use benzene, thinners, other volatile solvents, or chemical cloths.
- Do not touch the NX bus connectors.

9-1-2 Periodic Inspection

NX Units do not have parts with a specific life. However, its elements can deteriorate under improper environmental conditions. Periodic inspections are thus required to ensure that the required conditions are being maintained.

Inspection is recommended at least once every six months to a year, but more frequent inspections may be necessary depending on the severe environments.

Take immediate steps to correct the situation if any of the conditions in the following table are not met.

Periodic Inspection Items

No.	Inspection item	Inspection details	Criteria	Correction
1	External power supply	Is the power supply voltage measured at the terminal block within standards?	Within the power supply voltage range	Use a voltage tester to check the power supply at the terminals. Take necessary steps to bring the power supply within the power supply voltage range.
2	I/O power supply	Is the power supply voltage measured at the I/O terminal block within standards?	Voltages must be within I/O specifications of each NX Unit.	Use a voltage tester to check the power voltage at the terminals. Take necessary steps to bring the I/O power supply within NX Unit standards.
3	Ambient environment	Is the ambient operating temperature within standards?	0 to 55°C	Use a thermometer to check the temperature and ensure that the ambient operating temperature remains within the allowed range of 0 to 55°C.
		Is the ambient operating humidity within standards?	Relative humidity must be 10% to 95% with no condensation.	Use a hygrometer to check the humidity and ensure that the ambient operating humidity remains between 10% and 95%. Make sure that condensation does not occur due to rapid changes in temperature.
		Is it subject to direct sunlight?	Not in direct sunlight	Protect the Controller if necessary.
		Is there an accumulation of dirt, dust, salt, metal powder, etc.?	No accumulation	Clean and protect the Controller if necessary.
		Is there water, oil, or chemical sprays hitting the Controller?	No spray	Clean and protect the Controller if necessary.
		Are there corrosive or flammable gases in the area of the Controller?	No spray	Check by smell or use a sensor.
		Is the Unit subject to shock or vibration?	Vibration resistance and shock resistance must be within specifications.	Install cushioning or other vibration and shock absorbing equipment if necessary.
		Are there noise sources near the Controller?	No significant noise sources	Either separate the Controller and noise source, or protect the Controller.
4	Installation and wiring	Are the DIN track mounting hooks for each NX Unit securely locked?	No looseness	Securely lock the DIN track mounting hooks.
		Are the cable connectors fully inserted and locked?	No looseness	Correct any improperly installed connectors.
		Are there any loose screws on the End Plates (PFP-M)?	No looseness	Tighten loose screws with a Phillips-head screwdriver.
		Are the NX Units connected to each other along the hookup guides and inserted until they touch the DIN track?	You must connect and fix the NX Units to the DIN track.	Connect the NX Units to each other along the hookup guides and insert them until they touch the DIN track.
		Are there any damaged external wiring cables?	No visible damage	Check visually and replace cables if necessary.

Tools Required for Inspections

Required Tools

- Phillips screwdriver
- Flat-blade screwdriver
- Voltage tester or digital voltmeter
- Industrial alcohol and pure cotton cloth

Tools Required Occasionally

- Oscilloscope
- Thermometer and hygrometer

9-2 Maintenance Procedures

This section describes the procedures for backing up the data in the Digital I/O Units, and how to replace the Digital I/O Units.

9-2-1 Backing Up Data

Perform backups so that you can restore the EtherCAT Coupler Unit to its original state in the event of a failure or other problem.

The target data to back up on the EtherCAT Coupler Unit are listed below.

- Unit configuration information
- I/O allocation information
- Unit operation settings
- Hardware switch information
- Production information

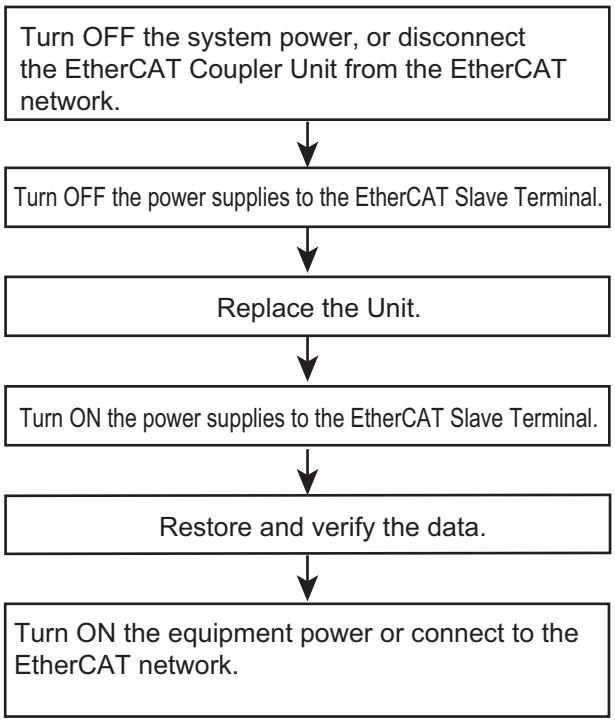
Precautions for Correct Use

The backup data for the EtherCAT Coupler Unit includes data for NX Units that store their settings in the EtherCAT Coupler Unit. If you replace the EtherCAT Coupler Unit, you must restore this data to restore the settings for these NX Units.

Refer to the user's manual of the Communications Coupler Unit for backup methods, and to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504) for the backup procedures.

9-2-2 Replacement Procedure for NX Units

This section describes the basic replacement procedures for the NX Units that are mounted after the EtherCAT Coupler Unit.


Turn OFF the system power, or disconnect the EtherCAT Coupler Unit from the EtherCAT network.
Turn OFF the power supplies to the EtherCAT Slave Terminal.
Replace the Unit.
Turn ON the power supplies to the EtherCAT Slave Terminal.
Restore and verify the data.
Turn ON the equipment power or connect to the EtherCAT network.

1 Turn OFF the power supply to all of the equipment or disconnect the EtherCAT Slave Terminal that includes the NX Unit to replace from the EtherCAT network.

2 Turn OFF the Unit power supplies and I/O power supplies for the EtherCAT Slave Terminal.

3 Replace the NX Unit. If the NX Unit has hardware switches, set the hardware switches to the same settings as on the original NX Unit.

4 Turn ON the Unit power supplies and I/O power supplies to the EtherCAT Slave Terminal.

5 Restore and verify data for the new NX Unit.

6 Turn ON the power supply to all of the equipment, or connect the EtherCAT Slave Terminal to the EtherCAT network.

Precautions for Correct Use

Checking the Serial Numbers of NX Units

If the Serial Number Check Method setting on the EtherCAT Coupler Unit is set to *Setting = Actual device*, temporarily change this setting to *None*, and then replace the NX Unit. Get the serial number of the new NX Unit, and then set the Serial Number Check Method setting on the EtherCAT Coupler Unit to *Setting = Actual device* again.
If you replace the NX Unit with the Serial Number Check Method setting set to *Setting = Actual device*, a Unit Configuration Verification Error will occur.

Refer to the user's manual of the Communications Coupler Unit for details on the Serial Number Check Method setting for the EtherCAT Coupler Unit.

Additional Information

- Refer to the *4-1 Installing NX Units* on page 4-2 for the procedures to mount and remove the NX Unit.
- Refer to the *NJ-series CPU Unit Built-in EtherCAT Port User's Manual* (Cat. No. W505) for the procedures to disconnect and connect the EtherCAT Coupler Unit from and to the EtherCAT network.
- Refer to *NJ-series CPU Unit Software User's Manual* (Cat. No. W501-E1-06 or later) for the procedures for restoring and comparing data.

A

Appendices

This section describes the data sheets of the Digital I/O Units and their dimensions.

A-1 Data Sheet A-2
A-1-1 Model List A-2
A-1-2 Digital Input Units A-4
A-1-3 Digital Output Units A-13
A-2 Dimensions A-25
A-2-1 Screwless Clamping Terminal Block Type A-25
A-3 EMC Directive Measures for Relay Outputs A-27
A-4 List of NX Objects A-28
A-4-1 Format of Object Descriptions A-28
A-4-2 Digital Input Units A-29
A-4-3 Digital Output Units A-34

A-1 Data Sheet

The specifications of individual Digital I/O Unit are shown below.

A-1-1 Model List

DC Input Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Internal I/O common	Rated input voltage	I/O refreshing method	ON/OFF response time	Reference
NX-ID3317	4 points	NPN	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	20 µs max./400 µs max.	P. A-5
NX-ID3343			24 VDC		100 ns max./100 ns max.	P. A-6
NX-ID3417		PNP	12 to 24 VDC		20 µs max./400 µs max.	P. A-7
NX-ID3443			24 VDC		100 ns max./100 ns max.	P. A-8
NX-ID4342	8 points	NPN			20 µs max./400 µs max.	P. A-9
NX-ID4442		PNP				P. A-10
NX-ID5342	16 points	NPN				P. A-11
NX-ID5442		PNP				P. A-12

Transistor Output Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Internal I/O common	Maximum value of load current	Rated voltage	I/O refreshing method	ON/OFF response time	Reference
NX-OD3121	4 points	NPN	0.5 A/point, 2 A/Unit	12 to 24 VDC	Switching Synchronous I/O refreshing and Free-Run refreshing	0.1 ms max./0.8 ms max.	P. A-15
NX-OD3153				24 VDC		300 ns max./300 ns max.	P. A-16
NX-OD3256		PNP				0.5 ms max./1.0 ms max.	P. A-17
NX-OD3257						300 ns max./300 ns max.	P. A-18
NX-OD4121	8 points	NPN	0.5 A/point, 4 A/Unit	12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-19
NX-OD4256		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-20
NX-OD5121	16 points	NPN		12 to 24 VDC		0.1 ms max./0.8 ms max.	P. A-21
NX-OD5256		PNP		24 VDC		0.5 ms max./1.0 ms max.	P. A-22

Relay Output Units (Screwless Clamping Terminal Block, 12 mm Width)

Model	Number of points	Relay type	Maximum switching capacity	I/O refreshing method	ON/OFF response time	Reference
NX-OC2633	2 points	N.O.	250 VAC/2 A (cosΦ = 1), 250 VAC/2 A (cosΦ = 0.4), 24 VDC/2 A, 4 A/Unit	Free-Run refreshing	15 ms max./15 ms max.	P. A-23

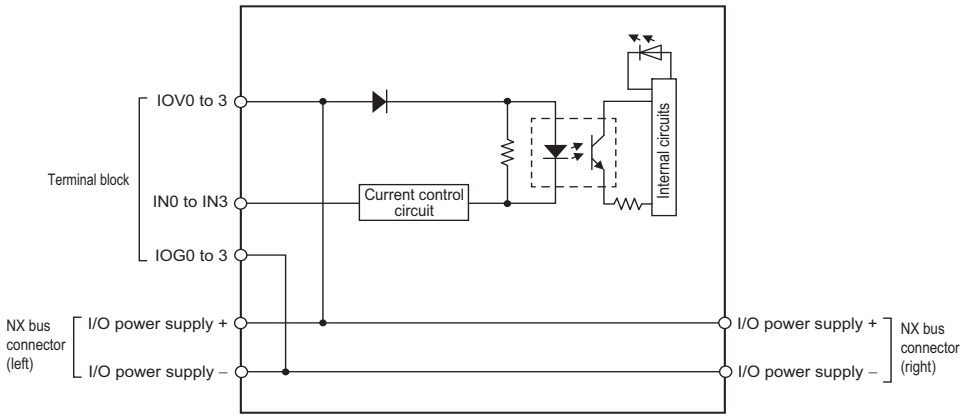
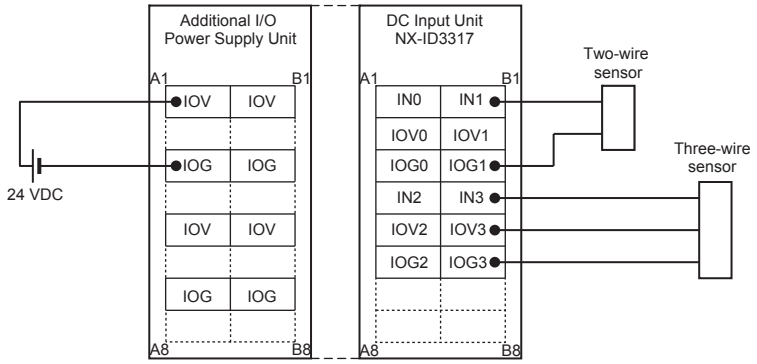
A-1-2 Digital Input Units

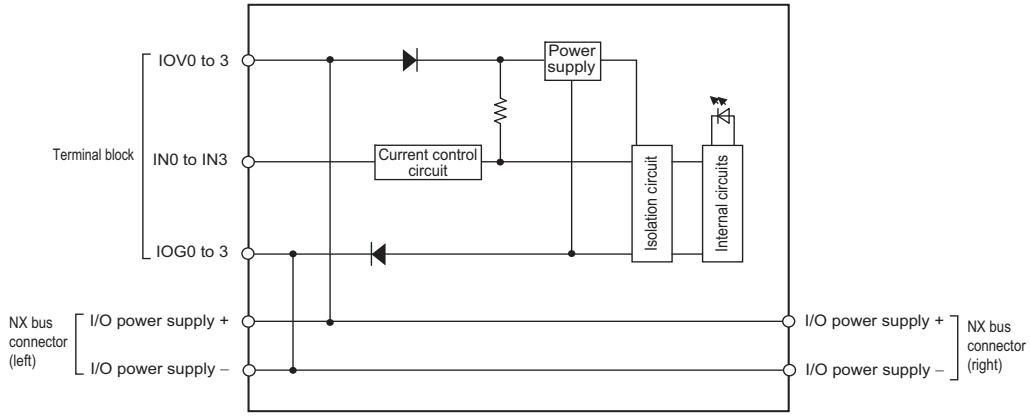
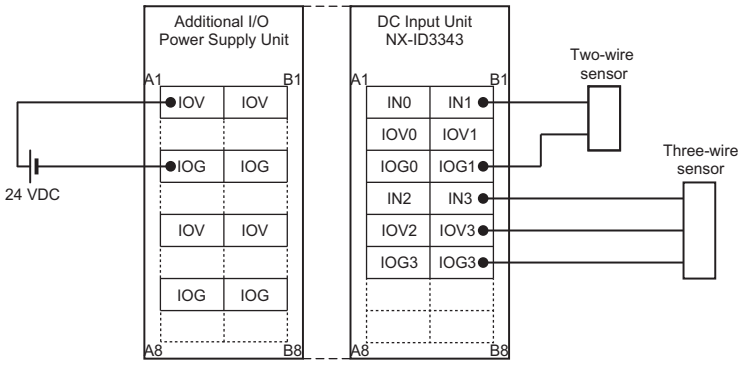
Description of Items on Data Sheet of the DC Input Units

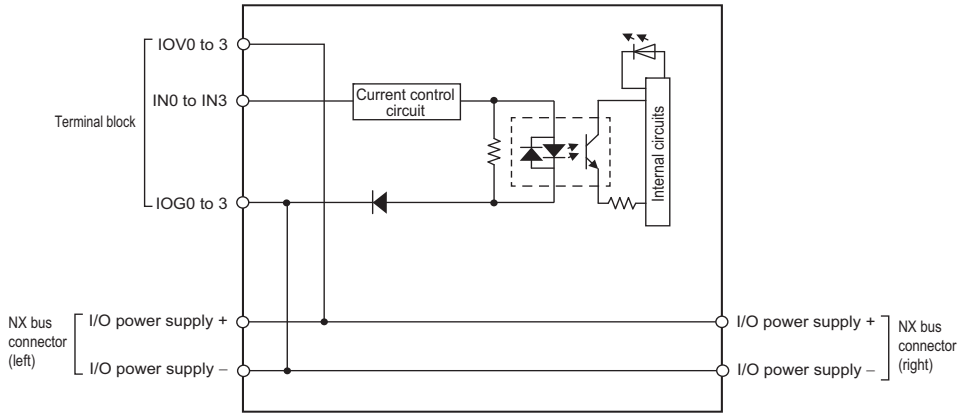
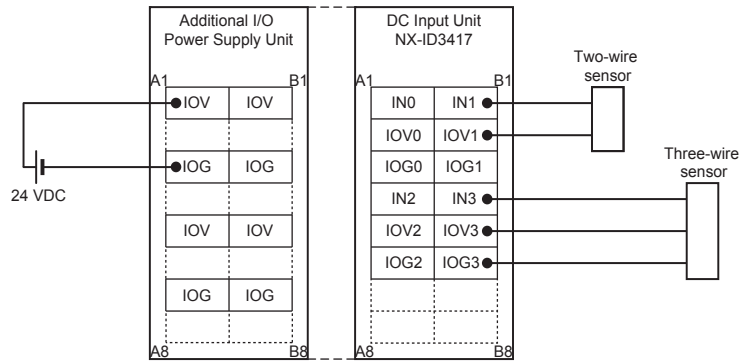
The meanings of the items on the data sheet of the DC Input Unit are explained in the table below.

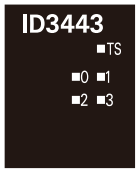
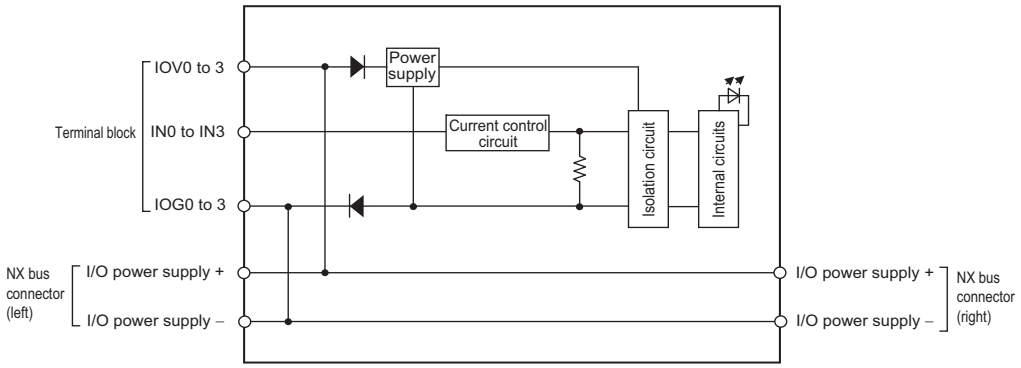
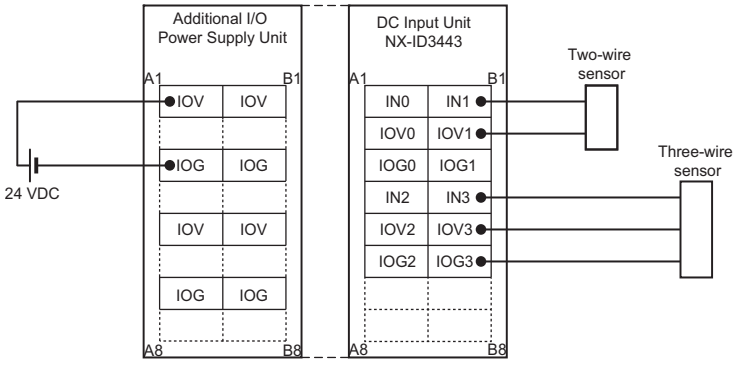
Item	Description
Unit name	The name of the Unit.
Model	The model of the Unit.
Number of points	The number of input points provided by the Unit.
External connection terminals	The type of terminal block and connector that is used for connecting the Unit. The number of terminals on the terminal block is also described when a screwless clamping terminal block is used.
I/O refreshing method	The I/O refreshing methods that are used by the Unit. Free-Run refreshing and Synchronous I/O refreshing are available.
Indicators	The type of indicators on the Unit and the layout of those indicators.
Internal I/O common	The polarity of the input devices that are connected to the Unit. NPN connection and PNP connection are available.
Rated input voltage	The rated input voltage and range of the Unit.
Input current	The input current at the rated voltage of the Unit.
ON voltage/ON current	The input voltage in which the Unit input turns ON, and corresponding input current.
OFF voltage/OFF current	The input voltage in which the Unit input turns OFF, and corresponding input current.
ON/OFF response time	The delay time for which the status change of the input terminals reaches the internal circuit of the Unit.The input filter time below is not included. It is described according to the ON/OFF sequence.
Input filter time	The filter time when the status of the internal circuit is read as the data to the internal of the Unit. It is same for both ON/OFF. The filter time to be set by the Support Software is described.
Dimensions	The dimensions of the Unit. They are described as W x H x D. The unit is "mm".
Isolation method	The isolation method between the input circuit and internal circuit of the Unit.
Insulation resistance	The insulation resistance between the input circuit and internal circuit of the Unit.
Dielectric strength	The dielectric strength between the input circuit and internal circuit of the Unit.
I/O power supply method	The method for supplying I/O power to the Unit. The supply method is determined for each Unit. The power is supplied from the NX bus or the external source.
Current capacity of I/O power supply terminal	The current capacity of the power supply terminals (IOV/IOG) of the Unit. Do not exceed this value when supplying the I/O power to the connected external devices.
NX Unit power consumption	The power consumption of the NX Unit power supply of the Unit.
Current consumption from I/O power supply	The current consumption from I/O power supply of the Unit. The above input current and current consumption of any connected external devices are excluded.
Weight	The weight of the Unit.
Circuit layout	The input circuit layout of the Unit.
Installation orientation and restrictions	The installation orientation of the Slave Terminal including the Unit, and the details of restrictions on the specifications due to the installation orientation.
Terminal connection diagram	A diagram of the connection between the Unit and connected external devices. When an I/O Power Supply Connection Unit or a Shield Connection Unit is required to be connected to the connected external devices, the description for such is included.
Disconnection/Short-circuit detection	The function of the Unit to detect a disconnection/short-circuit.
Protective function	The protective function that the Unit has.

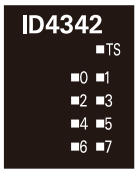
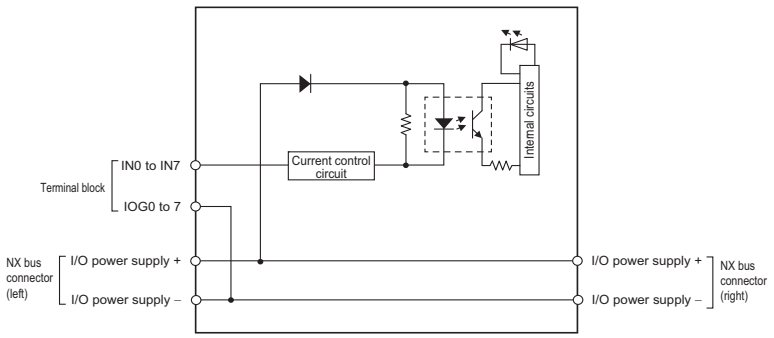
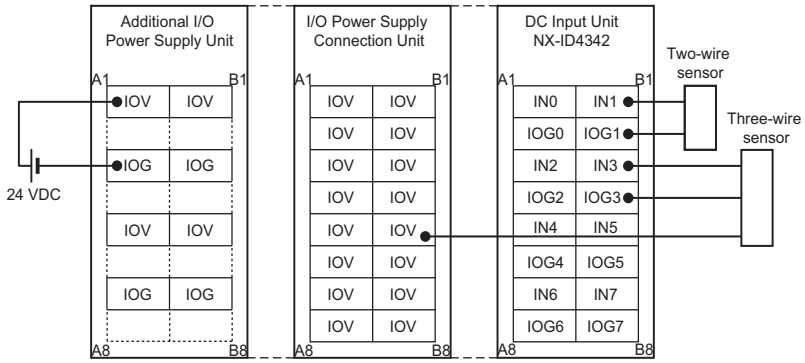
DC Input Units (Screwless Clamping Terminal Block, 12 mm Width)

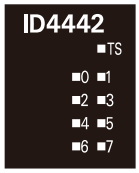
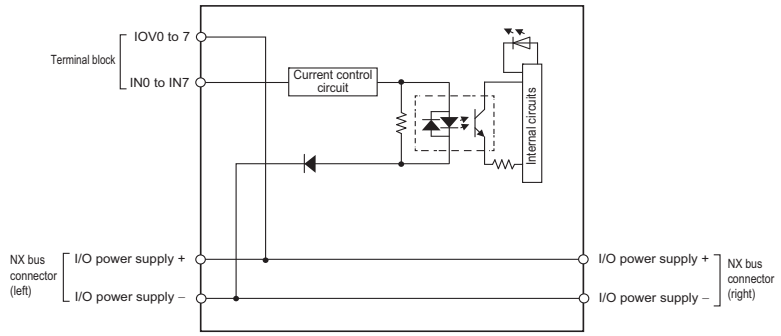
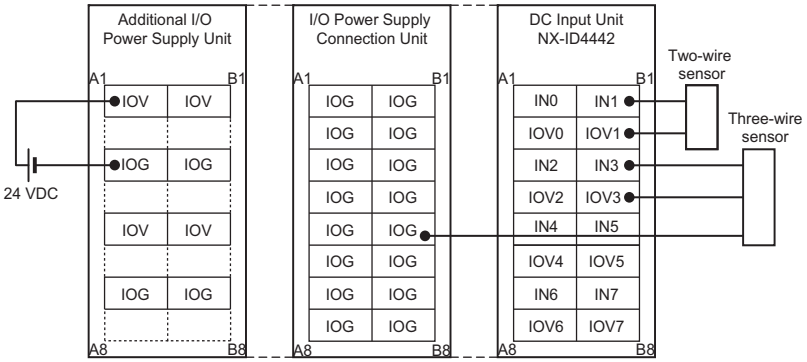
Unit name	DC Input Unit	**Model**	NX-ID3317
Number of points	4 points	**External connection terminals**	Screwless clamping terminal block (12 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, input indicators 	**Internal I/O common**	NPN
		Rated input voltage	12 to 24 VDC (9 to 28.8 VDC)
		Input current	6 mA typical (at 24 VDC), rated current
		ON voltage/ON current	9 VDC min./3 mA min. (between IOV and each signal)
		OFF voltage/OFF current	2 VDC max./1 mA max. (between IOV and each signal)
		ON/OFF response time	20 µs max./400 µs max.
		Input filter time	No filter, 0.25 ms, 0.5 ms, 1 ms (default), 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, 128 ms, 256 ms
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	IOV: 0.1 A/terminal max., IOG: 0.1 A/terminal max.
NX Unit power consumption	0.50 W max.	**Current consumption from I/O power supply**	No consumption
Weight	65 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	Not supported.

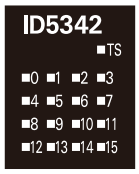
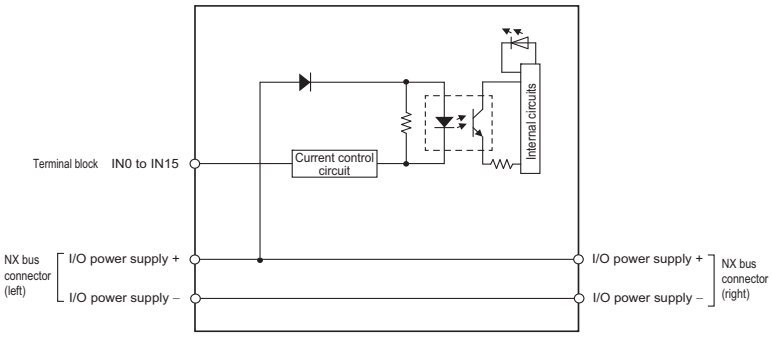
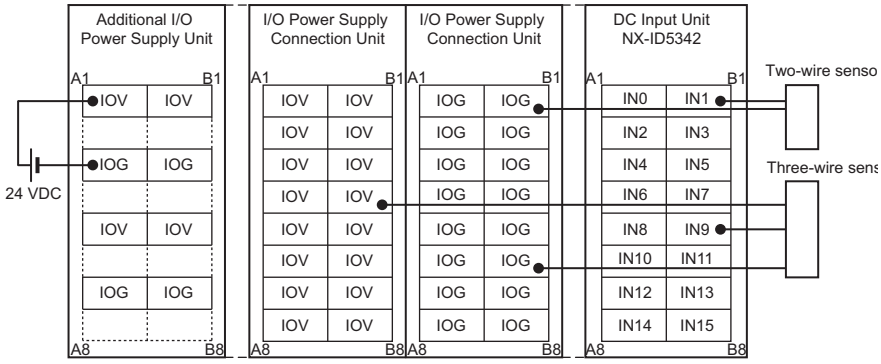
Unit name	DC Input Unit	**Model**	NX-ID3343
Number of points	4 points	**External connection terminals**	Screwless clamping terminal block (12 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, input indicators 	**Internal I/O common**	NPN
		Rated input voltage	24 VDC (15 to 28.8 VDC)
		Input current	3.5 mA typical (at 24 VDC), rated current
		ON voltage/ON current	15 VDC min./3 mA min. (between IOV and each signal)
		OFF voltage/OFF current	5 VDC max./1 mA max. (between IOV and each signal)
		ON/OFF response time	100 ns max./100 ns max.
		Input filter time	No filter, 1 µs, 2 µs, 4 µs, 8 µs (default), 16 µs, 32 µs, 64 µs, 128 µs, 256 µs
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Digital isolator isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	IOV: 0.1 A/terminal max., IOG: 0.1 A/terminal max.
NX Unit power consumption	0.55 W max.	**Current consumption from I/O power supply**	30 mA max.
Weight	65 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	Not supported.

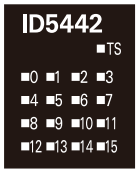
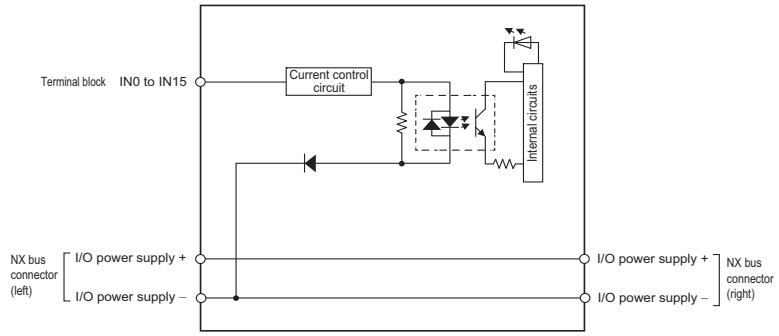
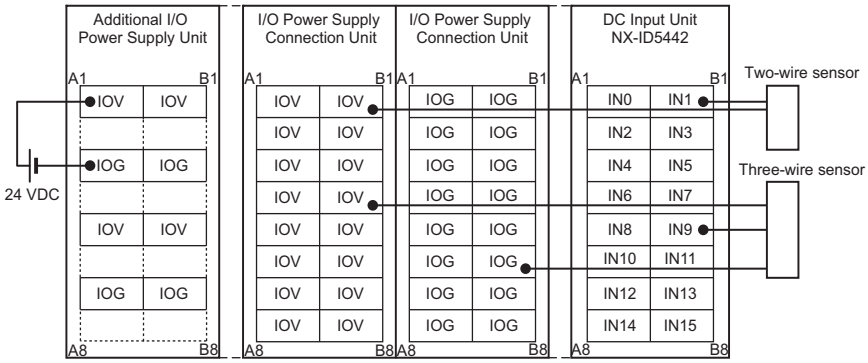
Unit name	DC Input Unit	**Model**	NX-ID3417
Number of points	4 points	**External connection terminals**	Screwless clamping terminal block (12 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, input indicators 	**Internal I/O common**	PNP
		Rated input voltage	12 to 24 VDC (9 to 28.8 VDC)
		Input current	6 mA typical (at 24 VDC), rated current
		ON voltage/ON current	9 VDC min./3 mA min. (between IOG and each signal)
		OFF voltage/OFF current	2 VDC max./1 mA max. (between IOG and each signal)
		ON/OFF response time	20 µs max./400 µs max.
		Input filter time	No filter, 0.25 ms, 0.5 ms, 1 ms (default), 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, 128 ms, 256 ms
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	IOV: 0.1 A/terminal max., IOG: 0.1 A/terminal max.
NX Unit power consumption	0.50 W max.	**Current consumption from I/O power supply**	No consumption
Weight	65 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	Not supported.

Unit name	DC Input Unit	**Model**	NX-ID3443
Number of points	4 points	**External connection terminals**	Screwless clamping terminal block (12 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, input indicators 	**Internal I/O common**	PNP
		Rated input voltage	24 VDC (15 to 28.8 VDC)
		Input current	3.5 mA typical (at 24 VDC), rated current
		ON voltage/ON current	15 VDC min./3 mA min. (between IOG and each signal)
		OFF voltage/OFF current	5 VDC max./1 mA max. (between IOG and each signal)
		ON/OFF response time	100 ns max./100 ns max.
		Input filter time	No filter, 1 µs, 2 µs, 4 µs, 8 µs (default), 16 µs, 32 µs, 64 µs, 128 µs, 256 µs
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Digital isolator isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	IOV: 0.1 A/terminal max., IOG: 0.1 A/terminal max.
NX Unit power consumption	0.55 W max.	**Current consumption from I/O power supply**	30 mA max.
Weight	65 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	Not supported.

Unit name	DC Input Unit	**Model**	NX-ID4342
Number of points	8 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, input indicators 	**Internal I/O common**	NPN
		Rated input voltage	24 VDC (15 to 28.8 VDC)
		Input current	3.5 mA typical (at 24 VDC), rated current
		ON voltage/ON current	15 VDC min./3 mA min. (between IOV and each signal)
		OFF voltage/OFF current	5 VDC max./1 mA max. (between IOV and each signal)
		ON/OFF response time	20 µs max./400 µs max.
		Input filter time	No filter, 0.25 ms, 0.5 ms, 1 ms (default), 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, 128 ms, 256 ms
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	IOG: 0.1 A/terminal max.
NX Unit power consumption	0.50 W max.	**Current consumption from I/O power supply**	No consumption
Weight	65 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	Not supported.

Unit name	DC Input Unit	**Model**	NX-ID4442
Number of points	8 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, input indicators 	**Internal I/O common**	PNP
		Rated input voltage	24 VDC (15 to 28.8 VDC)
		Input current	3.5 mA typical (at 24 VDC), rated current
		ON voltage/ON current	15 VDC min./3 mA min. (between IOG and each signal)
		OFF voltage/OFF current	5 VDC max./1 mA max. (between IOG and each signal)
		ON/OFF response time	20 µs max./400 µs max.
		Input filter time	No filter, 0.25 ms, 0.5 ms, 1 ms (default), 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, 128 ms, 256 ms
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	IOV: 0.1 A/terminal max.
NX Unit power consumption	0.50 W max.	**Current consumption from I/O power supply**	No consumption
Weight	65 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	Not supported.

Unit name	DC Input Unit	**Model**	NX-ID5342
Number of points	16 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, input indicators 	**Internal I/O common**	NPN
		Rated input voltage	24 VDC (15 to 28.8 VDC)
		Input current	2.5 mA typical (at 24 VDC), rated current
		ON voltage/ON current	15 VDC min./2 mA min. (between IOV and each signal)
		OFF voltage/OFF current	5 VDC max./0.5 mA max. (between IOV and each signal)
		ON/OFF response time	20 µs max./400 µs max.
		Input filter time	No filter, 0.25 ms, 0.5 ms, 1 ms (default), 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, 128 ms, 256 ms
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	0.55 W max.	**Current consumption from I/O power supply**	No consumption
Weight	65 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	Not supported.

Unit name	DC Input Unit	**Model**	NX-ID5442
Number of points	16 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, input indicators 	**Internal I/O common**	PNP
		Rated input voltage	24 VDC (15 to 28.8 VDC)
		Input current	2.5 mA typical (at 24 VDC), rated current
		ON voltage/ON current	15 VDC min./2 mA min. (between IOG and each signal)
		OFF voltage/OFF current	5 VDC max./0.5 mA max. (between IOG and each signal)
		ON/OFF response time	20 µs max./400 µs max.
		Input filter time	No filter, 0.25 ms, 0.5 ms, 1 ms (default), 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, 128 ms, 256 ms
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	0.55 W max.	**Current consumption from I/O power supply**	No consumption
Weight	65 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	Not supported.

A-1-3 Digital Output Units

Description of Items on the Data Sheet of the Transistor Output Unit

The meanings of the items on the data sheet of the Transistor Output Units are explained in the table below.

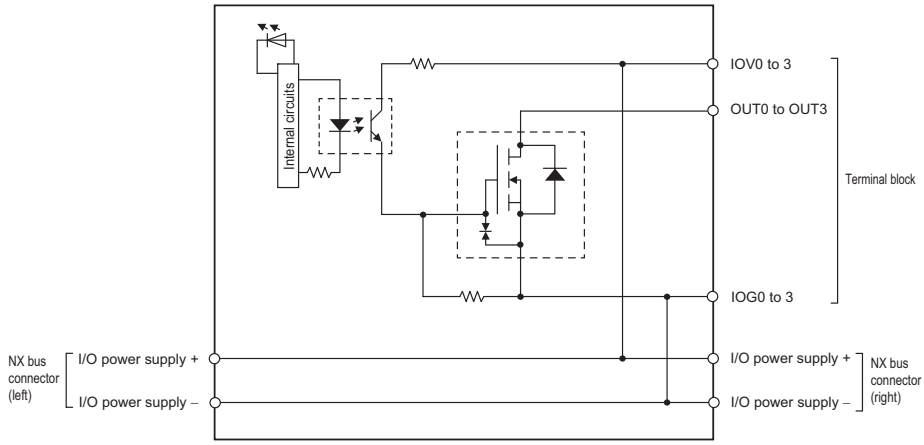
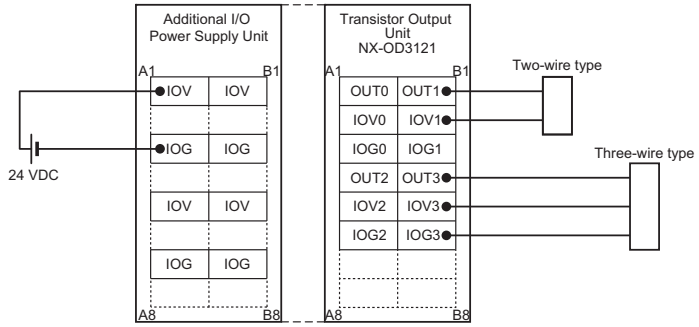
Item	Description
Unit name	The name of the Unit.
Model	The model of the Unit.
Number of points	The number of output points provided by the Unit.
External connection terminals	The type of terminal block and connector that is used for connecting the Unit. The number of terminals on the terminal block is also described when a screwless clamping terminal block is used.
I/O refreshing method	The I/O refreshing methods that are used by the Unit. Free-Run refreshing and Synchronous I/O refreshing are available.
Indicators	The type of indicators on the Unit and the layout of those indicators.
Internal I/O common	The polarity of the output devices that are connected to the Unit. NPN connection and PNP connection are available.
Rated voltage	The rated output voltage of the Unit.
Operating load voltage range	The output load voltage range of the Unit.
Maximum value of load current	The maximum output load current of the Unit. The specifications for each output point and for the Unit are described.
Maximum inrush current	The maximum allowable inrush current of the Unit. Any inrush current from an external connection load must be kept to or below this value.
Leakage current	The leakage current when the output of the Unit is OFF.
Residual voltage	The residual voltage when the output of the Unit is ON.
ON/OFF response time	The delay time for which data in the internal circuit is reflected in the state of output elements of the Unit. It is described according to the ON/OFF sequence.
Dimensions	The dimensions of the Unit. They are described as W x H x D. The unit is "mm".
Isolation method	The isolation method of the output circuit and internal circuit of the Unit.
Insulation resistance	The insulation resistance between the output circuit and internal circuit of the Unit.
Dielectric strength	The dielectric strength between the output circuit and internal circuit of the Unit.
I/O power supply method	The method for supplying I/O power to the Unit. The supply method is determined for each Unit. The power is supplied from the NX bus or the external source.
Current capacity of I/O power supply terminal	The current capacity of the I/O power supply terminals (IOV/IOG) of the Unit. Do not exceed this value when supplying the I/O power to the connected external devices.
NX Unit power consumption	The power consumption of the NX Unit power supply of the Unit.
Current consumption from I/O power supply	The current consumption from I/O power supply of the Unit. The load current of any external connection load and current consumption of any connected external devices are not included.
Weight	The weight of the Unit.
Circuit layout	The output circuit layout of the Unit.
Installation orientation and restrictions	The installation orientation of the Slave Terminal including the Unit, and the details of restrictions on the specifications due to the installation orientation.
Terminal connection diagram	A diagram of the connection between the Unit and connected external devices. When an I/O Power Supply Connection Unit or a Shield Connection Unit is required to be connected to the connected external devices, the description for such is included.
Disconnection/Short-circuit detection	The function of the Unit to detect a disconnection/short-circuit.
Protective function	The protective function that the Unit has.

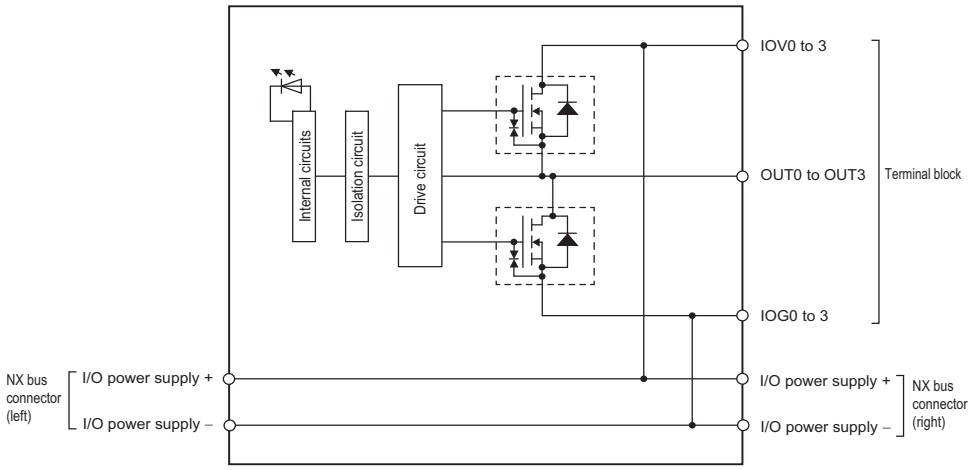
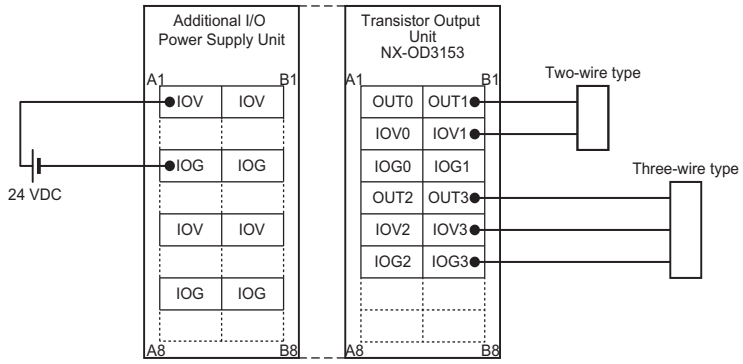
Description of Items on the Data Sheet of the Relay Output Unit

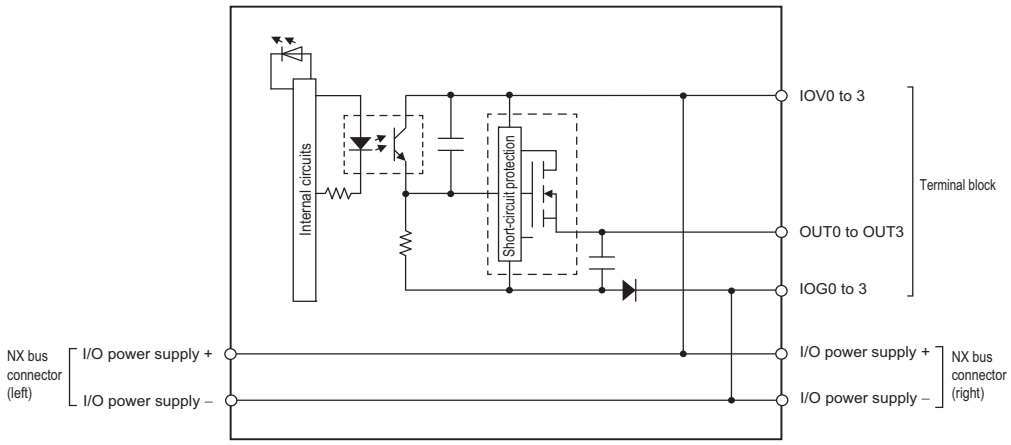
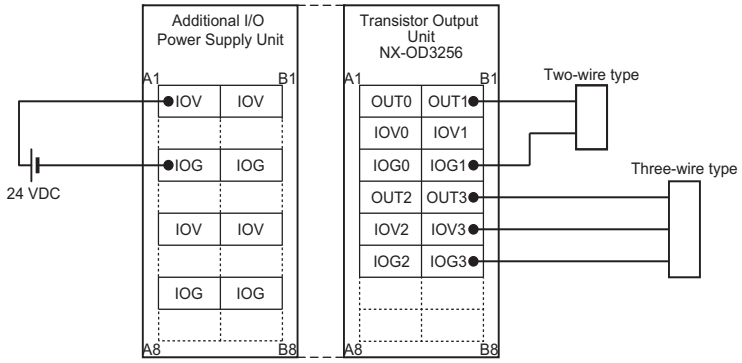
The meanings of the items on the data sheet of the Relay Output Unit are explained in the table below.

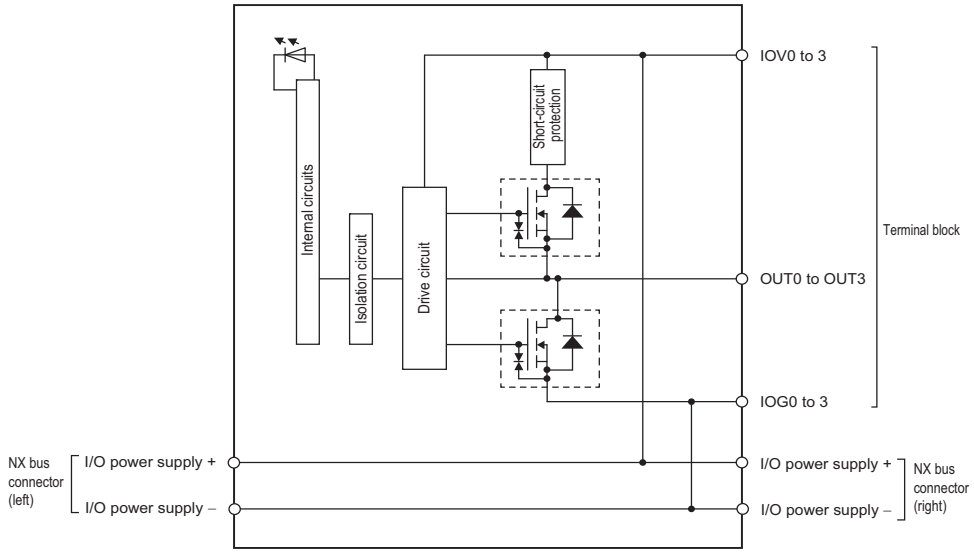
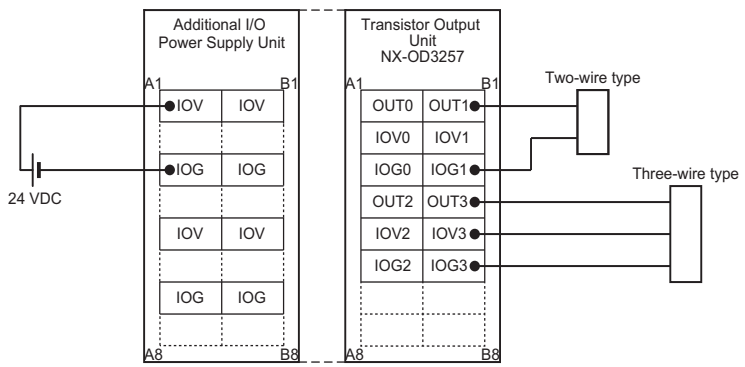
Item	Description
Unit name	The name of the Unit.
Model	The model of the Unit.
Number of points	The number of output points provided by the Unit.
External connection terminals	The type of terminal block and connector that is used for connecting the Unit. The number of terminals on the terminal block is also described when a screwless clamping terminal block is used.
I/O refreshing method	The I/O refreshing methods that are used by the Unit. Free-Run refreshing and Synchronous I/O refreshing are available.
Indicators	The type of indicators on the Unit and the layout of those indicators.
Relay type	The type of relay that is connected to the Unit. There are N.O. and N.O. + N.C..
Maximum switching capacity	The maximum value of switchable current of the connected relay.
Minimum switching capacity	The minimum value of switchable current of the connected relay.
Relay service life	The service life of the connected relay.
ON/OFF response time	The delay time for which data in the internal circuit is reflected in the state of output elements of the Unit. It is described according to the ON/OFF sequence.
Dimensions	The dimensions of the Unit. They are described as W x H x D. The unit is "mm".
Isolation method	The isolation method of the output circuit and internal circuit of the Unit.
Insulation resistance	The insulation resistance between the output circuit and internal circuit of the Unit.
Dielectric strength	The dielectric strength between the output circuit and internal circuit of the Unit.
Vibration resistance	The vibration-resistance specifications of the Unit. Some are different from the general specifications.
Shock resistance	These are the shock-resistance specifications of the Unit. Some are different from the general specifications.
I/O power supply method	The method for supplying I/O power to the Unit. The supply method is determined for each Unit. The power is supplied from the NX bus or the external source.
Current capacity of I/O power supply terminal	The current capacity of the I/O power supply terminals (IOV/IOG) of the Unit. Do not exceed this value when supplying the I/O power to the connected external devices.
NX Unit power consumption	The power consumption of the NX Unit power supply of the Unit.
Current consumption from I/O power supply	The current consumption from I/O power supply of the Unit. The load current of any external connection load and current consumption of any connected external devices are not included.
Weight	The weight of the Unit.
Circuit layout	The output circuit layout of the Unit.
Installation orientation and restrictions	The installation orientation of the Slave Terminal including the Unit, and the details of restrictions on the specifications due to the installation orientation.
Terminal connection diagram	A diagram of the connection between the Unit and connected external devices. When an I/O Power Supply Connection Unit or a Shield Connection Unit is required to be connected to the connected external devices, the description for such is included.
Disconnection/Short-circuit detection	The function of the Unit to detect a disconnection/short-circuit.
Protective function	The protective function that the Unit has.

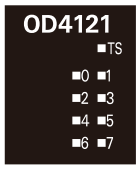
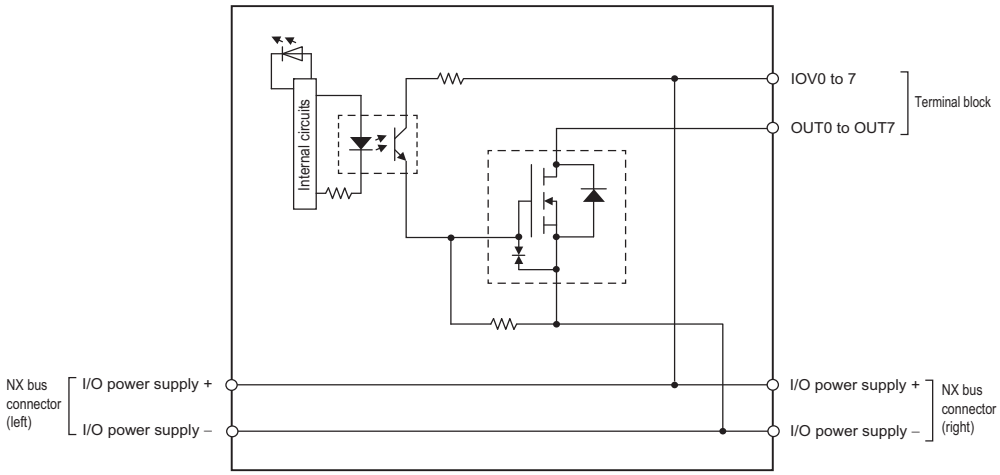
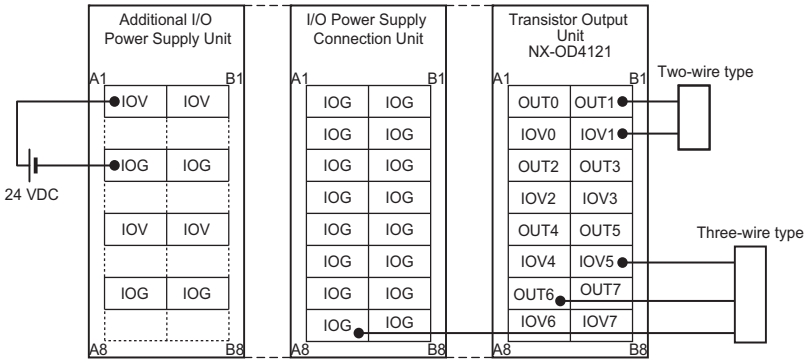
Transistor Output Units (Screwless Clamping Terminal Block, 12 mm Width)

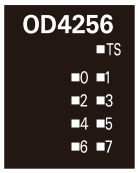
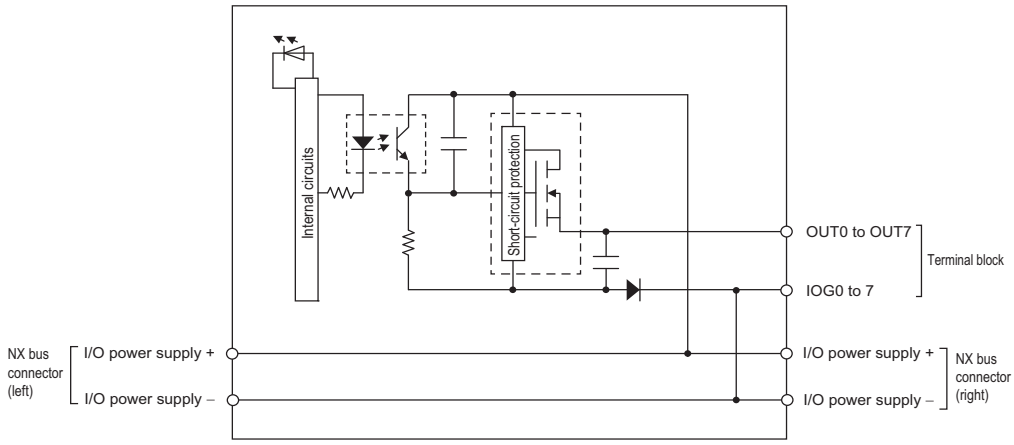
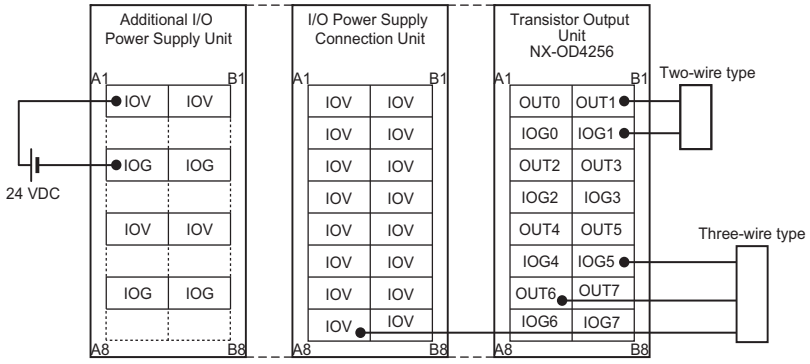
Unit name	Transistor Output Unit	**Model**	NX-OD3121
Number of points	4 points	**External connection terminals**	Screwless clamping terminal block (12 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, output indicator 	**Internal I/O common**	NPN
		Rated voltage	12 to 24 VDC
		Operating load voltage range	10.2 to 28.8 VDC
		Maximum value of load current	0.5 A/point, 2 A/NX Unit
		Maximum inrush current	4.0 A/point, 10 ms max.
		Leakage current	0.1 mA max.
		Residual voltage	1.5 V max.
		ON/OFF response time	0.1 ms max./0.8 ms max.
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	IOV: 0.5 A/terminal max., IOG: 0.5 A/terminal max.
NX Unit power consumption	0.55 W max.	**Current consumption from I/O power supply**	10 mA max.
Weight	70 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	Not supported.

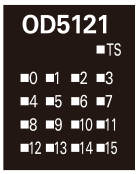
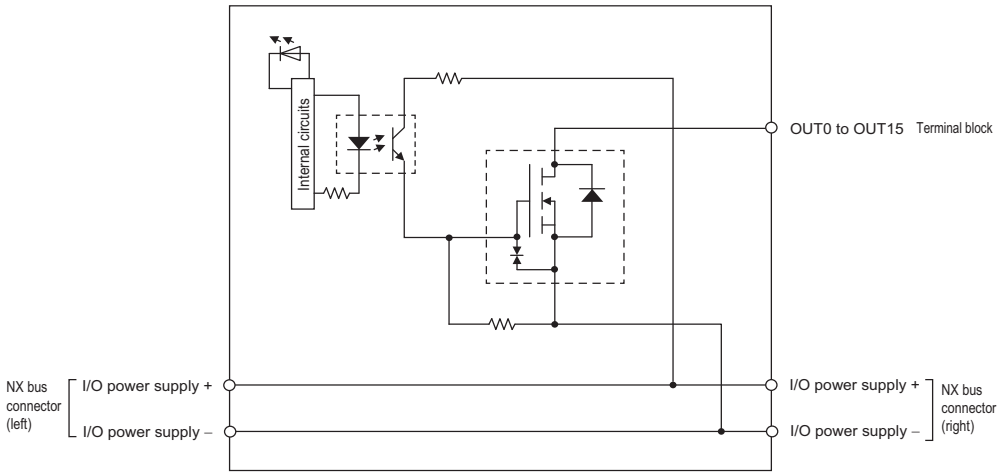
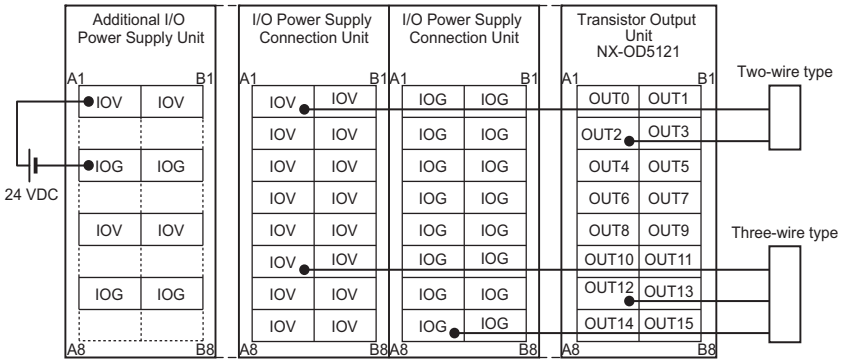
Unit name	Transistor Output Unit	**Model**	NX-OD3153
Number of points	4 points	**External connection terminals**	Screwless clamping terminal block (12 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, output indicator 	**Internal I/O common**	NPN
		Rated voltage	24 VDC
		Operating load voltage range	15 to 28.8 VDC
		Maximum value of load current	0.5 A/point, 2 A/NX Unit
		Maximum inrush current	4.0 A/point, 10 ms max.
		Leakage current	0.1 mA max.
		Residual voltage	1.5 V max.
		ON/OFF response time	300 ns max./300 ns max.
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Digital isolator isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	IOV: 0.5 A/terminal max., IOG: 0.5 A/terminal max.
NX Unit power consumption	0.50 W max.	**Current consumption from I/O power supply**	30 mA max.
Weight	70 g max.		
Circuit layout	 This unit uses a push-pull output circuit.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	Not supported.

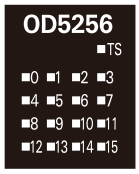
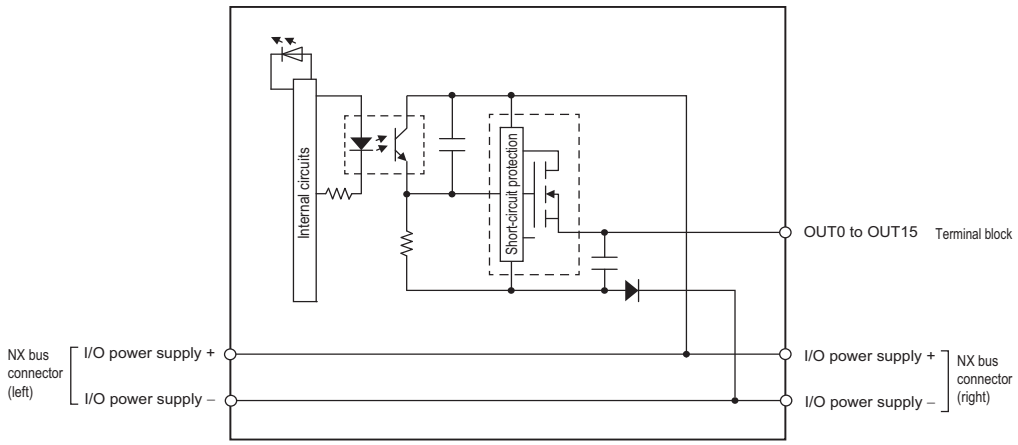
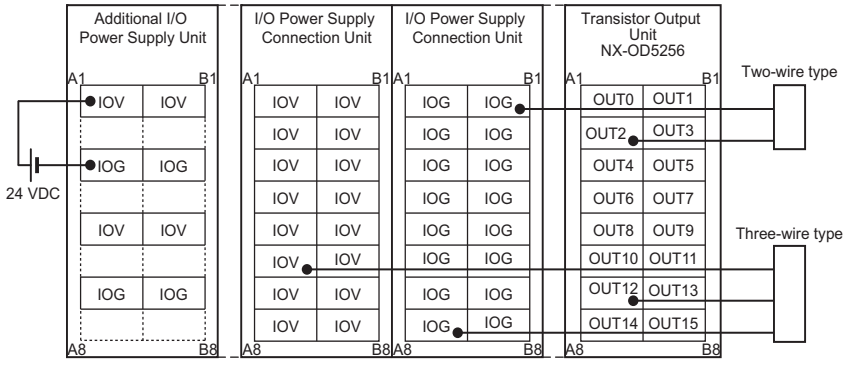
Unit name	Transistor Output Unit	Model	NX-OD3256
Number of points	4 points	External connection terminals	Screwless clamping terminal block (12 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, output indicator	Internal I/O common	PNP
		Rated voltage	24 VDC
		Operating load voltage range	15 to 28.8 VDC
		Maximum value of load current	0.5 A/point, 2 A/NX Unit
		Maximum inrush current	4.0 A/point, 10 ms max.
		Leakage current	0.1 mA max.
		Residual voltage	1.5 V max.
		ON/OFF response time	0.5 ms max./1.0 ms max.
Dimensions	12 (W) x 100 (H) x 71 (D)	Isolation method	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	Dielectric strength	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	Current capacity of I/O power supply terminal	IOV: 0.5 A/terminal max., IOG: 0.5 A/terminal max.
NX Unit power consumption	0.55 W max.	Current consumption from I/O power supply	20 mA max.
Weight	70 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	Protective function	With load short-circuit protection.

Unit name	Transistor Output Unit	**Model**	NX-OD3257
Number of points	4 points	**External connection terminals**	Screwless clamping terminal block (12 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, output indicator 	**Internal I/O common**	PNP
		Rated voltage	24 VDC
		Operating load voltage range	15 to 28.8 VDC
		Maximum value of load current	0.5 A/point, 2 A/NX Unit
		Maximum inrush current	4.0 A/point, 10 ms max.
		Leakage current	0.1 mA max.
		Residual voltage	1.5 V max.
		ON/OFF response time	300 ns max./300 ns max.
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Digital isolator isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	IOV: 0.5 A/terminal max., IOG: 0.5 A/terminal max.
NX Unit power consumption	0.50 W max.	**Current consumption from I/O power supply**	40 mA max.
Weight	70 g max.		
Circuit layout	 This unit uses a push-pull output circuit.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	With load short-circuit protection.

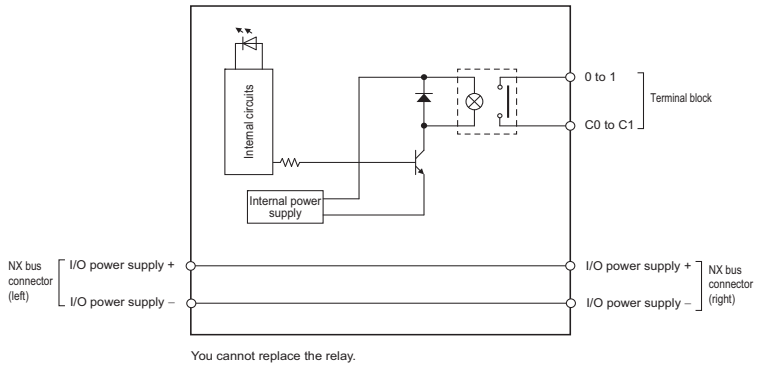
Unit name	Transistor Output Unit	**Model**	NX-OD4121
Number of points	8 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, output indicator 	**Internal I/O common**	NPN
		Rated voltage	12 to 24 VDC
		Operating load voltage range	10.2 to 28.8 VDC
		Maximum value of load current	0.5 A/point, 4 A/NX Unit
		Maximum inrush current	4.0 A/point, 10 ms max.
		Leakage current	0.1 mA
		Residual voltage	1.5 V max.
		ON/OFF response time	0.1 ms max./0.8 ms max.
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	IOV: 0.5 A/terminal max.
NX Unit power consumption	0.55 W max.	**Current consumption from I/O power supply**	10 mA max.
Weight	70 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	Not supported.

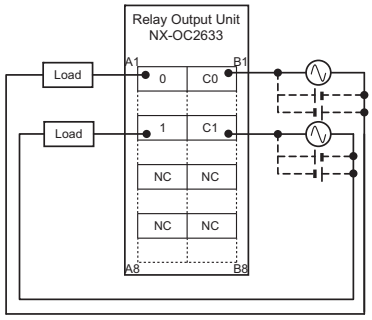
Unit name	Transistor Output Unit	**Model**	NX-OD4256
Number of points	8 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, output indicator 	**Internal I/O common**	PNP
		Rated voltage	24 VDC
		Operating load voltage range	15 to 28.8 VDC
		Maximum value of load current	0.5 A/point, 4 A/NX Unit
		Maximum inrush current	4.0 A/point, 10 ms max.
		Leakage current	0.1 mA max.
		Residual voltage	1.5 V max.
		ON/OFF response time	0.5 ms max./1.0 ms max.
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	IOG: 0.5 A/terminal max.
NX Unit power consumption	0.65 W max.	**Current consumption from I/O power supply**	30 mA max.
Weight	70 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	With load short-circuit protection.

Unit name	Transistor Output Unit	**Model**	NX-OD5121
Number of points	16 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing		
Indicators	TS indicator, output indicator 	**Internal I/O common**	NPN
		Rated voltage	12 to 24 VDC
		Operating load voltage range	10.2 to 28.8 VDC
		Maximum value of load current	0.5 A/point, 4 A/NX Unit
		Maximum inrush current	4.0 A/point, 10 ms max.
		Leakage current	0.1 mA max.
		Residual voltage	1.5 V max.
		ON/OFF response time	0.1 ms max./0.8 ms max.
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	0.65 W max.	**Current consumption from I/O power supply**	20 mA max.
Weight	70 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	Not supported.

Unit name	Transistor Output Unit	**Model**	NX-OD5256
Number of points	16 points	**External connection terminals**	Screwless clamping terminal block (16 terminals)
I/O refreshing method	Switching Synchronous I/O refreshing and Free-Run refreshing NX		
Indicators	TS indicator, output indicator 	**Internal I/O common**	PNP
		Rated voltage	24 VDC
		Operating load voltage range	15 to 28.8 VDC
		Maximum value of load current	0.5 A/point, 4 A/NX Unit
		Maximum inrush current	4.0 A/point, 10 ms max.
		Leakage current	0.1 mA max.
		Residual voltage	1.5 V max.
		ON/OFF response time	0.5 ms max./1.0 ms max.
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Photocoupler isolation
Insulation resistance	20 MΩ min. between isolated circuits (at 100 VDC)	**Dielectric strength**	510 VAC between isolated circuits for 1 minute at a leakage current of 5 mA max.
I/O power supply method	Supply from the NX bus	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	0.70 W max.	**Current consumption from I/O power supply**	40 mA max.
Weight	70 g max.		
Circuit layout			
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	With load short-circuit protection.

Relay Output Units (Screwless Clamping Terminal Block, 12 mm Width)

Unit name	Relay Output Unit	**Model**	NX-OC2633
Number of points	2 points, independent contacts	**External connection terminals**	Screwless clamping terminal block (8 terminals)
I/O refreshing method	Free-Run refreshing		
Indicators	TS indicator, output indicator 	**Relay type**	N.O. contact
		Maximum switching capacity	250 VAC/2 A (cosΦ = 1), 250 VAC/2 A (cosΦ = 0.4), 24 VDC/2 A, 4 A/Unit
		Minimum switching capacity	5 VDC, 1 mA
Relay service life	Electrical: 100,000 operations *1 Mechanical: 20,000,000 operations	**ON/OFF response time**	15 ms max./15 ms max.
Dimensions	12 (W) x 100 (H) x 71 (D)	**Isolation method**	Relay isolation
Insulation resistance	Between A1/B1 terminals and A3/B3 terminals: 20 MΩ min. (500 VDC) Between the external terminals and internal circuits: 20 MΩ min. (500 VDC) Between the internal circuit and GR terminal: 20 MΩ min. (100 VDC) Between the external terminals and GR terminal: 20 MΩ min. (500 VDC)	**Dielectric strength**	Between A1/B1 terminals and A3/B3 terminals: 2300 VAC for 1 min at a leakage current of 5 mA max. Between the external terminals and GR terminal: 2300 VAC for 1 min at a leakage current of 5 mA max. Between the external terminals and internal circuits: 2300 VAC for 1 min at a leakage current of 5 mA max. Between the internal circuit and GR terminal: 510 VAC for 1 min at a leakage current of 5 mA max.
Vibration resistance	Conforms to IEC60068-2-6. 5 to 8.4 Hz with amplitude of 3.5 mm, 8.4 to 150 Hz, acceleration of 9.8 m/s^2 100 min each in X, Y, and Z directions (10 sweeps of 10 min each = 100 min total)	**Shock resistance**	100 m/s^2, 3 times each in X, Y, and Z directions
I/O power supply method	Supply from external source	**Current capacity of I/O power supply terminal**	Without I/O power supply terminals
NX Unit power consumption	0.80 W max.	**Current consumption from I/O power supply**	No consumption
Weight	65 g max.		
Circuit layout	 You cannot replace the relay.		
Installation orientation and restrictions	Installation orientation: Possible in 6 orientations. Restrictions: No restrictions		

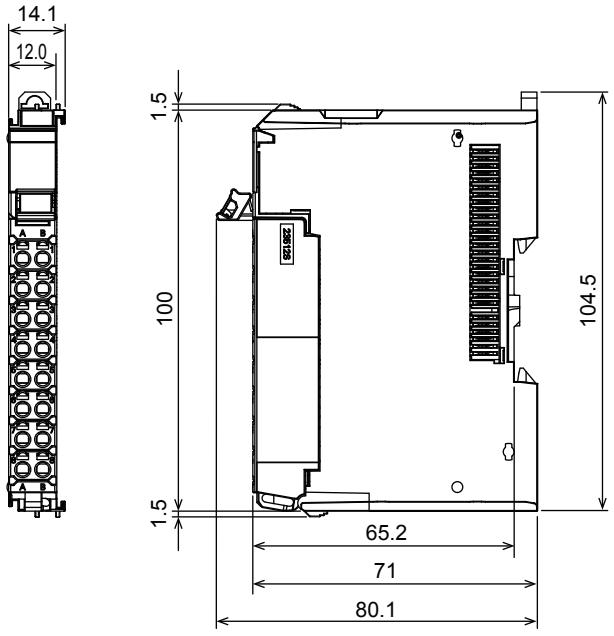
Terminal connection diagram			
Disconnection/Short-circuit detection	Not supported.	**Protective function**	Not supported.

*1. Electrical service life will vary depending on the current value. Refer to *Precautions when Using the Relay Output Units* on page 7-19 for details.

A-2 Dimensions

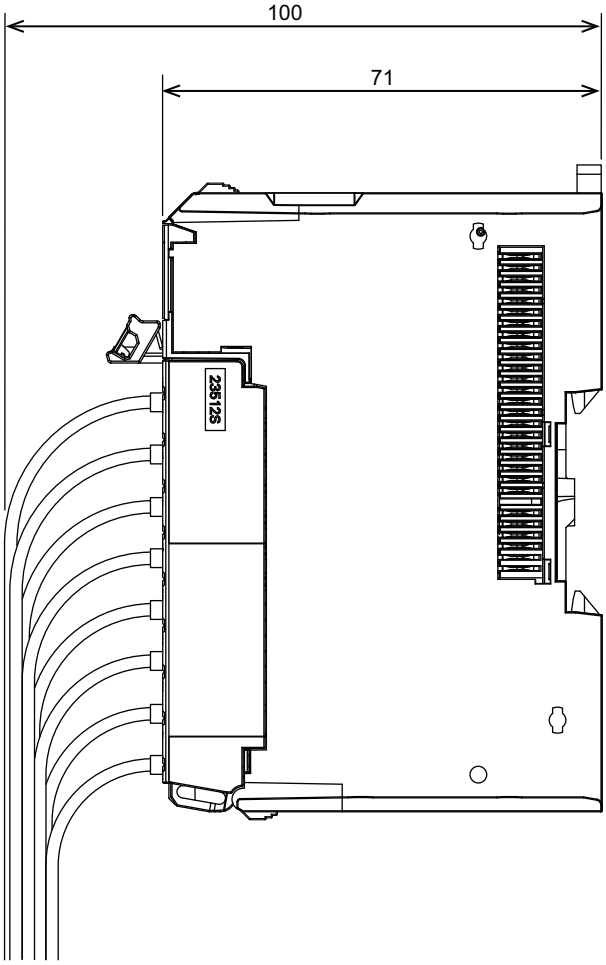
A-2-1 Screwless Clamping Terminal Block Type

12 mm Width



(Unit: mm)

Installation Height



(Unit: mm)

A-3 EMC Directive Measures for Relay Outputs

Conformance to EC Directives

The NX-series I/O Units conform to the Common Emission Standards (EN 61131-2) of the EMC Directives. However, when incorporating in the system, noise generated by relay output switching may not satisfy these Standards.

In such a case, appropriate countermeasures must be provided externally to the Output Unit, such as by connecting a contact protection circuit. Countermeasures taken to satisfy the standards vary depending on the devices on the load side, wiring, configuration of machines, etc.

Countermeasures

- Countermeasures are not required: the switching frequency of the entire system incorporating the Output Unit is less than 5 times per minute
- Countermeasures are required: the switching frequency of the entire system incorporating the Output Unit is more than 5 times per minute

Refer to EN61131-2 for details.

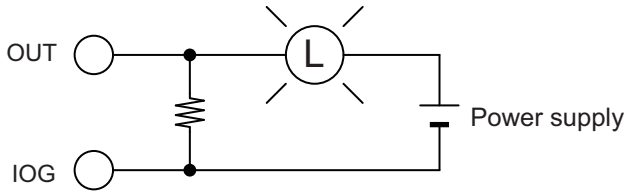
Countermeasure Example

The following measures must be taken.

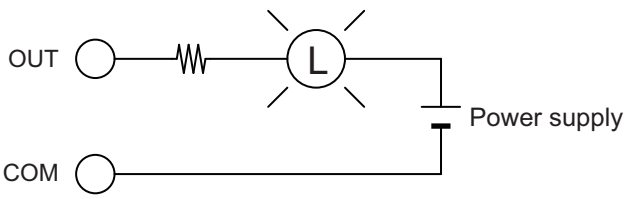
Use the measures to reduce the noises that are occurred.

- When switching an inductive load, connect a contact protection circuit in parallel with the load or contact. (Refer to *Inductive Load* on page 7-20.)
- When switching a load with a high inrush current such as an incandescent lamp, use either of the following methods to reduce the inrush current.

<Method 1. Draw about 1/3 of the current consumed by the load.>



<Method 2. Mount a limiting resistor.>



A-4 List of NX Objects

A-4-1 Format of Object Descriptions

In this manual, NX objects are described with the following format.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute

Index (Hex) : This is the index of the NX object that is expressed as a four-digit hexadecimal number.

Subindex (Hex) : This is the subindex of the NX object that is expressed as a two-digit hexadecimal number.

Object name : This is the name of the object. For a subindex, this is the name of the subindex.

Default value : This is the value that is set by default.

Data range : For a read-only (RO) NX object, this is the range of the data you can read. For a read-write (RW) NX object, this is the setting range of the data.

Unit : The unit is the physical units.

Data type : This is the data type of the object.

Access : This data tells if the object is read-only or read/write.

RO: Read only

RW: Read/write

I/O allocation : This tells whether I/O allocation is allowed.

Data attribute : This is the timing when changes to writable NX objects are enabled.

Y: Enabled by restarting

N: Enabled at all times

—: Write-prohibited

A-4-2 Digital Input Units

Unit Information Objects

This object gives the product information.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
1000	–	NX Bus Identify	–	–	–	–	–	–	–
	00	Number of Entries	7	7	–	USINT	RO	Not possible	–
	02	Model	*1	–	–	ARRAY [0..11] OF BYTE	RO	Not possible	–
	03	Device Type	*2	–	–	UDINT	RO	Not possible	–
	04	Product Code	*3	–	–	UDINT	RO	Not possible	–
	05	Vendor Code	00000001 hex *4	–	–	UDINT	RO	Not possible	–
	06	Unit Version	*5	–	–	UDINT	RO	Not possible	–
	07	Serial Number	*6	00000000 to FFFFFFFF hex	–	UDINT	RO	Not possible	–
1001	–	Production Info	–	–	–	–	–	–	–
	00	Number of Entries	2	2	–	USINT	RO	Not possible	–
	01	Lot Number	*7	00000000 to FFFFFFFF hex	–	UDINT	RO	Not possible	–
	02	Hardware Version	*8	–	–	ARRAY [0..19] OF BYTE	RO	Not possible	–

*1. The product models are assigned in ascending order from the lowest number of array elements. Any remainder elements are filled with spaces.

*2. The device types are assigned for each product Unit type.
Bits 0 to 31: Device type

*3. The product codes are assigned for each product model.
Bits 0 to 31: Product code

*4. OMRON vendor code

*5. Bits 24 to 31: Integer part of the Unit version.
Bits 16 to 23: Fractional part of the Unit version.
Bits 0 to 15: Reserved
(Example) For Ver.1.0, 0100□□□□ hex

*6. A unique serial number is assigned for each product unit.
Bits 0 to 31: Serial number

*7. The year, month, and day of production are assigned to the "lot number".
Bits 24 to 31: Date of production
Bits 16 to 23: Month of production
Bits 8 to 15: Year of production
Bits 0 to 7: Reserved

*8. The hardware version is assigned in ascending order from the earliest number of array elements. Any remainder elements are filled with spaces.

Objects That Accept I/O Allocations

These objects accept I/O allocations.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
6000	-	Bit Input	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Bit 00	FALSE	TRUE or FALSE	–	BOOL	RO	Possible	–
	02	Input Bit 01	FALSE	TRUE or FALSE	–	BOOL	RO	Possible	–
	03	Input Bit 02	FALSE	TRUE or FALSE	–	BOOL	RO	Possible	–
	04	Input Bit 03	FALSE	TRUE or FALSE	–	BOOL	RO	Possible	–

*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID3317/ID3343/ID3417/ID3443	4	4 (fixed)
Other models	0	0 (fixed)

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
6001	–	BYTE Input	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Bit (8 bits)	00 hex	00 to FF hex *2	–	BYTE	RO	Possible	–

*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID4342/ID4442	1	1 (fixed)
Other models	0	0 (fixed)

*2. Detailed data for Input Bit (8 bits) are as follows.
Bit 00: Input Bit 00
Bit 01: Input Bit 01
.
.
.
Bit 07: Input Bit 07

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
6002	–	Word Input	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Bit (16 bits)	0000 hex	0000 to FFFF hex *2	–	WORD	RO	Possible	–

*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID5342/ID5442	1	1 (fixed)
Other models	0	0 (fixed)

*2. Detailed data for Input Bit (16 bits) are as follows.
Bit 00: Input Bit 00
Bit 01: Input Bit 01
.
.
.
Bit 15: Input Bit 15

Other Objects

This section lists other objects.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5000	–	Input Filter Setting	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Filter Value Setting	3	0 to 11 *2	–	USINT	RW	Not possible	Y
	02	Input Filter Mode Setting	0	0/1 *3	–	USINT	RW	Not possible	Y

*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID3317/ID3417/ID4342/ID4442/ ID5342/ID5442	2	2 (fixed)
Other models	0	0 (fixed)

*2. The meaning of the set values for Input Filter Value Setting is as follows.

Set value	Meaning
0	No Filter
1	0.25 ms
2	0.5 ms
3	1 ms
4	2 ms
5	4 ms
6	8 ms
7	16 ms
8	32 ms
9	64 ms
10	128 ms
11	256 ms

*3. The meaning of the set values for Input Filter Mode Setting is as follows.

Set value	Meaning
0	Enable ON Filter and OFF Filter
1	Enable Only OFF Filter

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5001	–	Input Filter Setting	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Input Filter Value Setting	4	0 to 9 *2	–	USINT	RW	Not possible	Y
	02	Input Filter Mode Setting	0	0/1 *3	–	USINT	RW	Not possible	Y

*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-ID3343/ID3443	2	2 (fixed)
Other models	0	0 (fixed)

*2. The meaning of the set values for Input Filter Value Setting is as follows.

Set value	Meaning
0	No Filter
1	1 μs
2	2 μs
3	4 μs
4	8 μs
5	16 μs
6	32 μs
7	64 μs
8	128 μs
9	256 μs

*3. The meaning of the set values for Input Filter Mode Setting is as follows.

Set value	Meaning
0	Enable ON Filter and OFF Filter
1	Enable Only OFF Filter

A-4-3 Digital Output Units

Unit Information Objects

This object gives the product information.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
1000	–	NX Bus Identify	–	–	–	–	–	–	–
	00	Number of Entries	7	7	–	USINT	RO	Not possible	–
	02	Model	*1	–	–	ARRAY [0..11] OF BYTE	RO	Not possible	–
	03	Device Type	*2	–	–	UDINT	RO	Not possible	–
	04	Product Code	*3	–	–	UDINT	RO	Not possible	–
	05	Vendor Code	00000001 hex *4	–	–	UDINT	RO	Not possible	–
	06	Unit Version	*5	–	–	UDINT	RO	Not possible	–
	07	Serial Number	*6	00000000 to FFFFFFFF hex	–	UDINT	RO	Not possible	–
1001	–	Production Info	–	–	–	–	–	–	–
	00	Number of Entries	2	2	–	USINT	RO	Not possible	–
	01	Lot Number	*7	00000000 to FFFFFFFF hex	–	UDINT	RO	Not possible	–
	02	Hardware Version	*8	–	–	ARRAY [0..19] OF BYTE	RO	Not possible	–

*1. The product models are assigned in ascending order from the lowest number of array elements. Any remainder elements are filled with spaces.

*2. The device types are assigned for each product Unit type.
Bits 0 to 31: Device type

*3. The product codes are assigned for each product model.
Bits 0 to 31: Product code

*4. OMRON vendor code

*5. Bits 24 to 31: Integer part of the Unit version.
Bits 16 to 23: Fractional part of the Unit version.
Bits 0 to 15: Reserved
(Example) For Ver.1.0, 0100□□□□ hex

*6. A unique serial number is assigned for each product unit.
Bits 0 to 31: Serial number

*7. The year, month, and day of production are assigned to the "lot number".
Bits 24 to 31: Date of production
Bits 16 to 23: Month of production
Bits 8 to 15: Year of production
Bits 0 to 7: Reserved

*8. The hardware version is assigned in ascending order from the earliest number of array elements. Any remainder elements are filled with spaces.

Objects That Accept I/O Allocations

These objects accept I/O allocations.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
7000	–	Bit Output	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Output Bit 00	FALSE	TRUE or FALSE	–	BOOL	RW	Possible	N
	02	Output Bit 01	FALSE	TRUE or FALSE	–	BOOL	RW	Possible	N
	03	Output Bit 02	FALSE	TRUE or FALSE	–	BOOL	RW	Possible	N
	04	Output Bit 03	FALSE	TRUE or FALSE	–	BOOL	RW	Possible	N

*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD3121/OD3153/OD3256/OD3257	4	4 (fixed)
NX-OC2633	2	2 (fixed)
Other models	0	0 (fixed)

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
7001	–	BYTE Output	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Output Bit (8 bits)	00 hex	00 to FF hex	–	BYTE	RW	Possible	N

*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD4121/OD4256	1	1 (fixed)
Other models	0	0 (fixed)

*2. Detailed data for Output Bit (8 bits) are as follows.
Bit 00: Output Bit 00
Bit 01: Output Bit 01
.
.
.
Bit 07: Output Bit 07

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
7002	–	Word Output	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Output Bit (16 bits)	0000 hex	0000 to FFFF hex	–	WORD	RW	Possible	N

*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD5121/OD5256	1	1 (fixed)
Other models	0	0 (fixed)

*2. Detailed data for Output Bit (16 bits) are as follows.
Bit 00: Output Bit 00
Bit 01: Output Bit 01
.
.
.
Bit 15: Output Bit 15

Other Objects

This section lists other objects.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5010	–	Load Rejection Output Setting	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Load Rejection Output for Output Bit 00	FALSE	TRUE or FALSE *2	–	BOOL	RW	Not possible	Y
	02	Load Rejection Output for Output Bit 01	FALSE		–	BOOL	RW	Not possible	Y
	03	Load Rejection Output for Output Bit 02	FALSE		–	BOOL	RW	Not possible	Y
	04	Load Rejection Output for Output Bit 03	FALSE		–	BOOL	RW	Not possible	Y

*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD3121/OD3153/OD3256/OD3257	4	4 (fixed)
NX-OC2633	2	2 (fixed)
Other models	0	0 (fixed)

*2. The meaning of the set values for Load Rejection Output for Output Bit □□ is as follows.

Set value	Meaning
FALSE	OFF
TRUE	Hold the present value.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5011	–	Load Rejection Byte Setting	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Load Rejection Output for Output Bit (8 bits)	00 hex	00 to FF hex*2	–	BYTE	RW	Not possible	Y

*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD4121/OD4256	1	1 (fixed)
Other models	0	0 (fixed)

*2. The detailed data and meaning of the set values for Load Rejection Output for Output Bit (8 bits) are as follows.
Bit 00: Load Rejection Output for Output Bit 00
Bit 01: Load Rejection Output for Output Bit 01
.
.
.
Bit 07: Load Rejection Output for Output Bit 07

Set value	Meaning
0	OFF
1	Hold the present value.

Index (hex)	Subindex (hex)	Object name	Default value	Data range	Unit	Data type	Access	I/O allocation	Data attribute
5012	–	Load Rejection Word Setting	–	–	–	–	–	–	–
	00	Number of Entries	*1	*1	–	USINT	RO	Not possible	–
	01	Load Rejection Output for Output Bit (16 bits)	0000 hex	0000 to FFFF hex*2	–	WORD	RW	Not possible	Y

*1. The default value and data range for Number of Entries are as follows.

NX Units	Default value	Data range
NX-OD5121/OD5256	1	1 (fixed)
Other models	0	0 (fixed)

*2. The detailed data and meaning of the set values for Load Rejection Output for Output Bit (16 bits) are as follows.
Bit 00: Load Rejection Output for Output Bit 00
Bit 01: Load Rejection Output for Output Bit 01
.
.
.
Bit 15: Load Rejection Output for Output Bit 15

Set value	Meaning
0	OFF
1	Hold the present value.

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